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INSTRUCTION BOOK

RDR-1 AIRBORNE RADAR SYSTEM Type ANT-1() ANTENNAS



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I.B. 735

Preliminary

BENDIX RADIO

DIVISION OF BENDIX AVIATION CORPORATION

BALTIMORE 4, MARYLAND

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ARC TYPE A-326A ANTENNA

PURPOSE AND USE. The ARC Type A-326A Antenna (ARC-25070) is a uhf dipole used for reception of glide-slope signals. The antenna consists of a nickel-plated brass can and two detachable antenna elements. The can contains a matching section that transforms the antenna impedance to 52 ohms. Connection to the antenna is made through a BNC connector mounted on the bottom of the can.

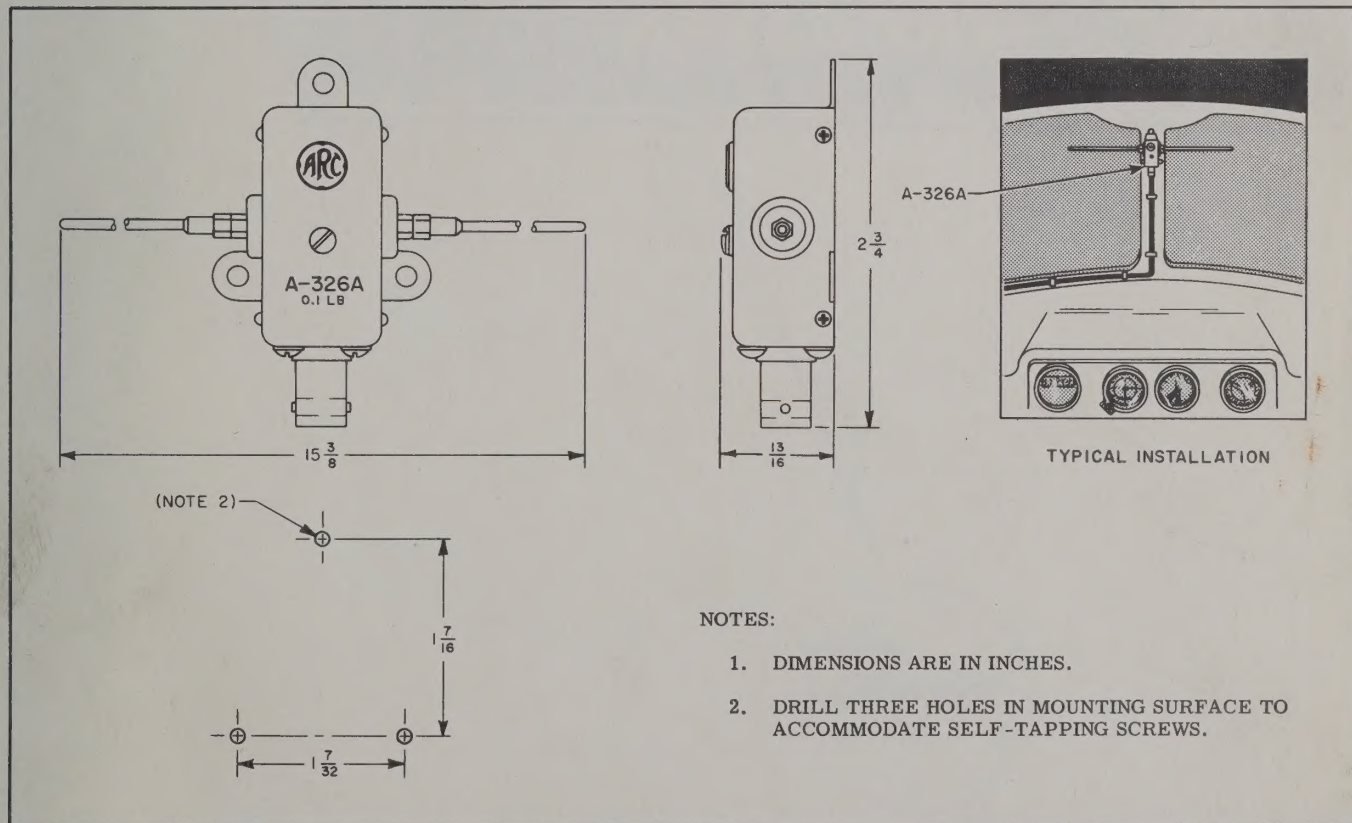
SPECIFICATIONS.

Design Frequency Range: 329 to 336 mc
Impedance: 52 ohms
VSWR: 1.5:1

Dimensions: 15-3/4 inches wide, 2-1/4 inches high, 7/8 inch deep
Weight: 0.1 pound

INSTALLATION. The A-326A is designed to be mounted inside an aircraft, in the windshield area, or inside the nose of an aircraft if the nose is made of Fiberglas. Installation dimensions are shown in the accompanying illustration. The location of the antenna will depend on the aircraft in which it is to be installed. Since the location of the antenna will affect its operating characteristics, observe the following recommendations:

1. Keep the antenna symmetrical with the centerline of the aircraft.
2. Avoid running lead-in or guy wires near the A-326A.
3. Mount the antenna as far as possible from other antennas on the aircraft.
4. Keep the antenna elements at least 9 inches from metallic surfaces.



A-326A Antenna, Installation Dimensions

TP3031

INSTRUCTION BOOK

RDR-1 AIRBORNE RADAR SYSTEM Type ANT-1() ANTENNAS



BENDIX RADIO

**DIVISION OF BENDIX AVIATION CORPORATION
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I.B. 735

Preliminary

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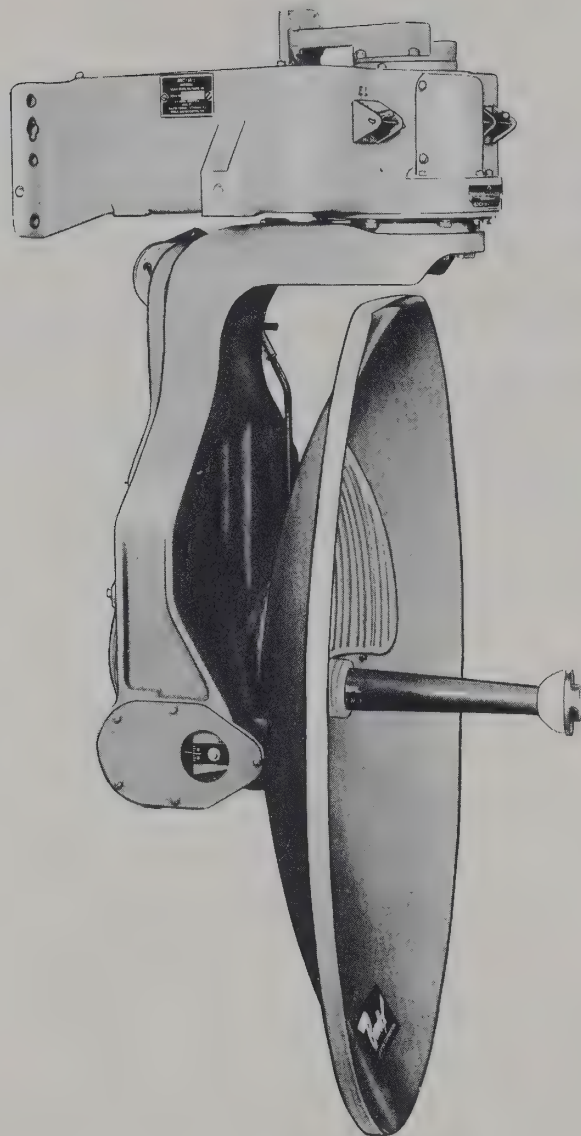


Figure 1-1. Typical ANT-1() X-band Antenna, Part of RDR-1 (X-band) Airborne Radar System

SECTION I

GENERAL DESCRIPTION

1-1. GENERAL.

This handbook covers the Bendix types ANT-1B(), ANT-1C(), ANT-1D(), and ANT-1E() Antennas, which are a part of the Bendix type RDR-1 Airborne Radar Systems.

Types ANT-1B() and ANT-1E() Antennas are for use with X-band systems.

Types ANT-1C() and ANT-1D() Antennas are for use with C-band systems.

This handbook is a part of, and must be used with, the RDR-1 Airborne Radar System Instruction Book I. B. 732 (for X-band systems) or I. B. 733 (for C-band systems).

The system instruction book contains a general description and theory of system operation, installation instructions, and operating procedures.

This instruction book (I. B. 735) contains a general description, maintenance and service data, and circuit theory of the above mentioned antenna types. A group assembly parts list is included in section VIII and is coded to exploded view drawings of the antennas, figure 9-10, sheets 1, 2, and 3.

1-2. FUNCTION OF EQUIPMENT.

The antenna functions are both electrical and electromechanical. The electrical functions consist of forming the electromagnetic energy generated within the radar set into a beam, radiating this beam of energy, and receiving with equal facility the energy reflected back to it by targets within the range and area covered by the radiated beam.

Antenna types ANT-1B and ANT-1E include provisions for changing the normally horizontally polarized pencil beam into a vertically polarized csc^2 (cosecant-squared) beam fanned in the vertical plane.

The electromechanical functions consist of rotating the radiated beam in the horizontal plane at a fixed rate, providing selective beam coverage above or below the horizontal, and furnishing synchro data for stabilization and sweep trace synchronization.

1-3. DESCRIPTION OF EQUIPMENT.

a. GENERAL. --The antenna assembly consists of a reflector, r-f feed system, azimuth and elevation drive systems, azimuth and elevation position synchros, and mounting provisions. The antenna is adaptable to nose mounting in all modern commercial transport aircraft.

Types ANT-1B() and ANT-1E() are similar X-band antennas except that the ANT-1B() is equipped with a 22-inch reflector and the ANT-1E() is equipped with a 30-inch reflector.

Types ANT-1C() and ANT-1D() are similar C-band antennas except that the ANT-1C() is equipped with a 22-inch reflector and the ANT-1D() is equipped with a 30-inch reflector.

b. ELECTRICAL. --Electrical connections to the antenna are made through connector plug P2001 on the rear of the antenna mounting base. R-f connection is made to the flange connector terminating the top waveguide section of the rotary joint assembly.

The antenna requires 115 volts, 380-420 cps single phase, for operation of the antenna azimuth drive motor B2001; 26 volts, 380-420 cps single phase, for reference phase of azimuth synchro generator B2002 and tilt control transmitter B2005; 115 volts, 380-420 cps autopilot reference voltage, for tilt drive motor B2004; 28 volts dc to energize the gyrator (beam rotator) in X-band antennas. Pitch and roll voltages from the aircraft's vertical gyro are required for antenna stabilization.

c. MECHANICAL. --The complete antenna is a composite assembly of both fixed and movable elements. The fixed elements consist of the mounting base or

housing (1, figure 9-1), which includes versatile mounting facilities, and the input section of the rotary joint (2). The movable elements include the reflector assembly (4) and the reflector hanger assembly (3).

The reflector mount will accept either 22-inch or 30-inch truncated reflectors. The focal length of the 22-inch reflector is 8 inches; the focal length of the 30-inch reflector is 10.6 inches. Therefore, each size of reflector requires a feed section which matches its focal length.

Index marks (6) are provided at 0-degree azimuth setting and at 0, ± 5 , ± 10 , and ± 15 degrees of beam tilt. These markings are factory adjusted and should not be disturbed unless it is definitely established that the indexes are no longer accurate.

The antenna waveguide assembly is designed to restrict leakage of air, bled into it from the aircraft's pressurized cabin, to 2 cubic inches per minute for a pressure differential of one atmosphere.

The antenna mounting base provides mounting versatility. The two flanges (3, figure 9-3) allow mounting directly to the aircraft's forward bulkhead, and available brackets permit standoff mounting where more rear clearance is required. Two bosses (7, figure 9-1) permit railmounting or support. The antenna can be mounted base-above-reflector, or inverted, with proper internal wiring changes.

The antenna is designed in accordance with AIRINC Equipment Characteristics, CAA certifications, and TSO requirements and provides the necessary margins of safety, performance, and mechanical ruggedness required of aircraft installations.

1-4. EQUIPMENT SUPPLIED.

The equipment supplied as a type ANT-1() is tabulated in figure 3-2 for C-band antennas and in figure 3-3 for X-band antennas. Antenna weights and dimensions are also shown in these two illustrations.

Section I
Paragraphs 1-5 to 1-6

GENERAL DESCRIPTION

1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

All other equipment and accessories required for the installation and operation of the antenna as a system component are listed in section I of the system instruction book. Additional data and installation accessories are presented in figures 3-1, 3-2, and 3-3 of this handbook.

1-6. SUMMARY OF SPECIFICATIONS.

Table 1-1 contains a summary of the electrical and physical specifications covering types ANT-1B(), ANT-1C(), ANT-1D(), and ANT-1E() Antennas.

TABLE 1-1. SUMMARY OF SPECIFICATIONS

	ANT-1B()	ANT-1C()	ANT-1D()	ANT-1E()
Operating band	X	C	C	X
Operating frequency	9345 to 9405 megacycles	5370 to 5430 megacycles	5370 to 5430 megacycles	9245 to 9405 megacycles
Reflector diameters	22 inches	22 inches	30 inches	30 inches
Focal length	8 inches	8 inches	10.6 inches	10.6 inches
3 db beam width E plane --	4 degrees at 9375 megacycles	7.5 degrees at 5400 megacycles	5.5 degrees at 5400 megacycles	2.9 degrees at 9375 megacycles
H plane --	4 degrees at 9375 megacycles	7.5 degrees at 5400 megacycles	6 degrees at 5400 megacycles	3.2 degrees at 9375 megacycles
Power capacity (peak) for 0.001 duty cycle	Up to 60 kw	Up to 125 kw	Up to 125 kw	Up to 60 kw
VSWR (maximum) at Tilt angle = 0° --	1.25	1.25	1.25	1.25
Tilt angle up to 15° --	1.5	1.5	1.5	1.5
Tilt angle up to 25° --	1.6	1.6	1.6	1.6
Tilt angle = 25° --	1.8	1.8	1.8	1.8
Maximum variation in VSWR with azimuth rotation (constant tilt angle)	0.05	0.05	0.05	0.05
Side lobes (0° tilt) Azimuth --	At least 18 db down	At least 18 db down	At least 18 db down	At least 18 db down
Elevation --	At least 16.5 db down	At least 18 db down	At least 18 db down	At least 17 db down
Csc ² beam at 0° tilt -- (azimuth only)	At least 16 db down	-- -- --	-- -- --	At least 16 db down

TABLE 1-1. SUMMARY OF SPECIFICATIONS (Continued)

	ANT-1B()	ANT-1C()	ANT-1D()	ANT-1E()
Antenna gain: (Nose of beam)				
Pencil beam --	31 ±1 db	26.6 ±1 db	29.5 ±1 db	34 ±1 db
Csc ² beam --	29 ±1 db	- - - -	- - - -	32 ±1 db
Ferrite rotator: Must rotate beam --	90 ±10°	- - - -	- - - -	90 ±10°
Csc ² beam pattern to follow a csc ² curve from -4.5° to -33° within -- (where curve is referenced to -4.5°)	±2-1/2 db	- - - -	- - - -	±3 db
Azimuth rotation: Degrees --	360	360	360	360
Rate --	15 ±3 rpm	15 ±3 rpm	15 ±3 rpm	15 ±3 rpm
Tilt limits: Remote positioning to --	±15°	±15°	±15°	±15°
Stabilization tilt limits, minimum -- (referenced to 0° tilt)	±25°	±25°	±25°	±25°
Synchros to indicate beam positions: Elevation (within) --	±1/8°	±1/8°	±1/8°	±1/8°
Azimuth (within) --	±1/4°	±1/4°	±1/4°	±1/4°
Units designed for operation under ambient conditions of:				
Temperature --	-40° C to +55° C (-40° F to +131° F)			
Humidity --	10 per cent to 90 per cent at +50° C (+122° F)			
Pressures				
External	Sea level to 45,000 feet			
Inside waveguide	Pressurized from sea level to 16,000 feet			
Weights and dimensions:				
C-band antennas --	See figure 3-2			
X-band antennas --	See figure 3-3			

SECTION II

THEORY OF OPERATION

2-1. GENERAL.

This section covers the theory of operation of C-band antenna types ANT-1C() and ANT-1D() and X-band antenna types ANT-1B() and ANT-1E(), all of which provide circular azimuth scanning at a rate of 15 ± 3 rpm.

X-band models are equipped to provide switchable csc^2 (cosecant squared) beam pattern coverage for mapping purposes, in addition to the normal pencil beam for storm detection.

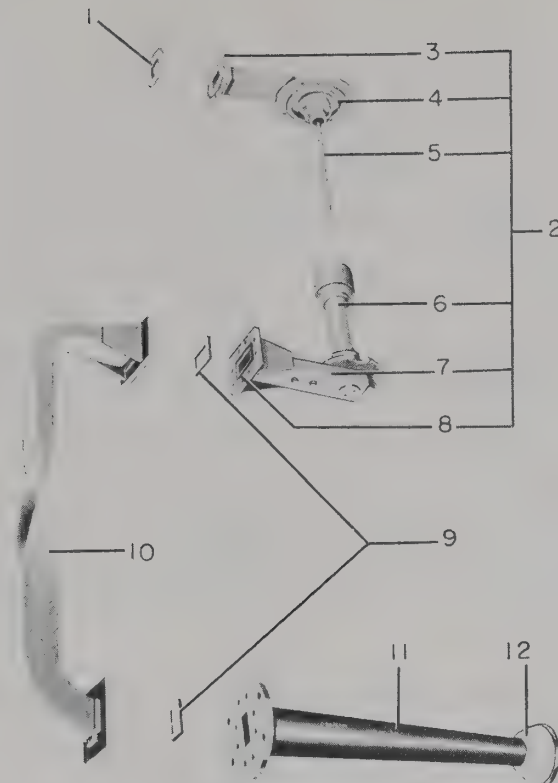
The elevation axis is servo controlled to provide line-of-sight stabilization of the pitch and roll axes when supplied with vertical reference information from an autopilot or separate vertical gyro. The range of stabilization is ± 25 degrees at zero tilt angle of the antenna. A cockpit tilt control can be used to modify the horizontal scanning plane to compensate for prolonged changes in the ship's attitude or for scanning above or below the plane of flight path. Azimuth synchro data are available for use with the indicator presentation.

X-band and C-band antennas have identical azimuth and elevation drive systems, identical servo system components and functions, and, except for the csc^2 beam facility incorporated in the X-band antennas, identical r-f functions. The following theory of operation, therefore, applies equally to all of the antenna types listed above, except as specifically noted.

2-2. R-F SYSTEM.

a. GENERAL.--Figure 2-1 shows the basic parts of the r-f waveguide system in typical ANT-1() Antennas.

During transmitting periods, the rf generated by the radar transmitter is fed to the r-f input connector (3, figure 2-1) of the antenna, travels through the rotary



- | | |
|------------------------|------------------------------------|
| 1 Pressure seal gasket | 7 Transition |
| 2 Rotary joint | 8 R-f output flange |
| 3 R-f input flange | 9 R-f and pressure gasket |
| 4 Transition | 10 Connecting section of waveguide |
| 5 Center conductor | 11 R-f feed section |
| 6 Outer conductor | 12 Circular ring feed |

Figure 2-1. Basic Parts of ANT-1() Antenna Waveguide System

joint assembly (2), continues through the axial twist section (10) to the circular feed section (11). The axial twist section (10) effects horizontal polarization of the r-f wave at the input to the circular feed section (11). When the r-f wave reaches the circular ring feed (12) at the end of the circular feed section, it is directed to a parabolic reflector which forms the r-f wave into a pencil beam and reflects the beam forward at an elevation angle (M-N, figure 2-9) that depends on the tilt angle (J-K) of the reflector.

X-band antenna types ANT-1B() and ANT-1E() are equipped to provide either a pencil beam or a csc^2 beam as explained later.

b. WAVEGUIDE.

(1) STANDARD.--X-band antenna types ANT-1B() and ANT-1E() use standard 1/2 x 1-inch rectangular waveguide in combination with the coaxial section of the rotary joint (2, figure 2-1), and for the axial twist section (10).

(2) DOUBLE RIDGED.--C-band antenna types ANT-1C() and ANT-1D() use double ridged waveguide (type ARA-136) in the same application as in (1) above.

(3) AXIAL TWIST SECTION.--The axial twist section of the waveguide (10, figure 2-1) has a vertically-polarized input flange, a 90-degree E-plane bend, a 90-degree axial twist, a 90-degree H-plane bend, and a horizontally-polarized output flange. This complex section of waveguide provides horizontal polarization of the r-f wave at the input to the circular feed section (11). See section VII for modifications to this section of the waveguide.

(4) ROTARY JOINT.--The rotary joint (2, figure 2-1) is an assembly consisting of two sections. One section (3-4-5) consists of an input flange (3), a transition (4) from rectangular or double-ridged waveguide to coaxial waveguide, and the center conductor (5) of the coaxial waveguide section. The other section (6-7-8) consists of the outer conductor (6) of the coaxial section, a transition (7) from coaxial to rectangular or double-ridged waveguide, and an output flange (8). The rotary joint is a matched and tuned assembly and must be replaced in its entirety if either section

is damaged. The inner conductor (5) of the coaxial waveguide section can be replaced, as explained in section VI, if it alone is damaged.

(5) CIRCULAR FEED SECTION.--The circular feed section (11, figure 2-1) is an assembly composed of an input flange, a section of tapered circular waveguide, and is terminated with a dielectric-filled circular ring feed.

The polarization of the transmitted r-f wave, as fed to the circular feed section, is always horizontal. The circular feed section just described is used on all C-band antennas and does not effect the r-f wave polarization; therefore, the radiated wave has horizontal polarization.

The circular feed section used on X-band antennas (figure 2-2) is similar to the one just described but includes a gyrator (beam rotator) which, when energized, rotates the polarization of microwaves passing through it. Refer to paragraph 2-2c following.

c. GYRATOR (BEAM ROTATOR).

(1) GENERAL.--The gyrator used in X-band antenna types ANT-1B() and ANT-1E() is composed of a ferrite rod surrounded by a magnetizing coil. (See figure 2-2.) This combination of ferrite core, magnetizing coil, and circular waveguide forms a gyrator (beam rotator) which, when properly energized, rotates the polarization of an electromagnetic wave directed through it.

Ferrites are non-metallic, ceramic-like materials which have magnetic properties similar to iron but with resistivities similar to insulators.

Ferrite used as a microwave element depends, in principle, on the Faraday rotation of a polarized wave. The gyrator, therefore, makes use of the Faraday rotation in a rod of ferrite placed in the waveguide and magnetized along its center axis by the magnetizing coil around it.

The ferrite material itself is essentially transparent to microwaves, and attenuation of the transmitted energy by the ferrite is negligible.

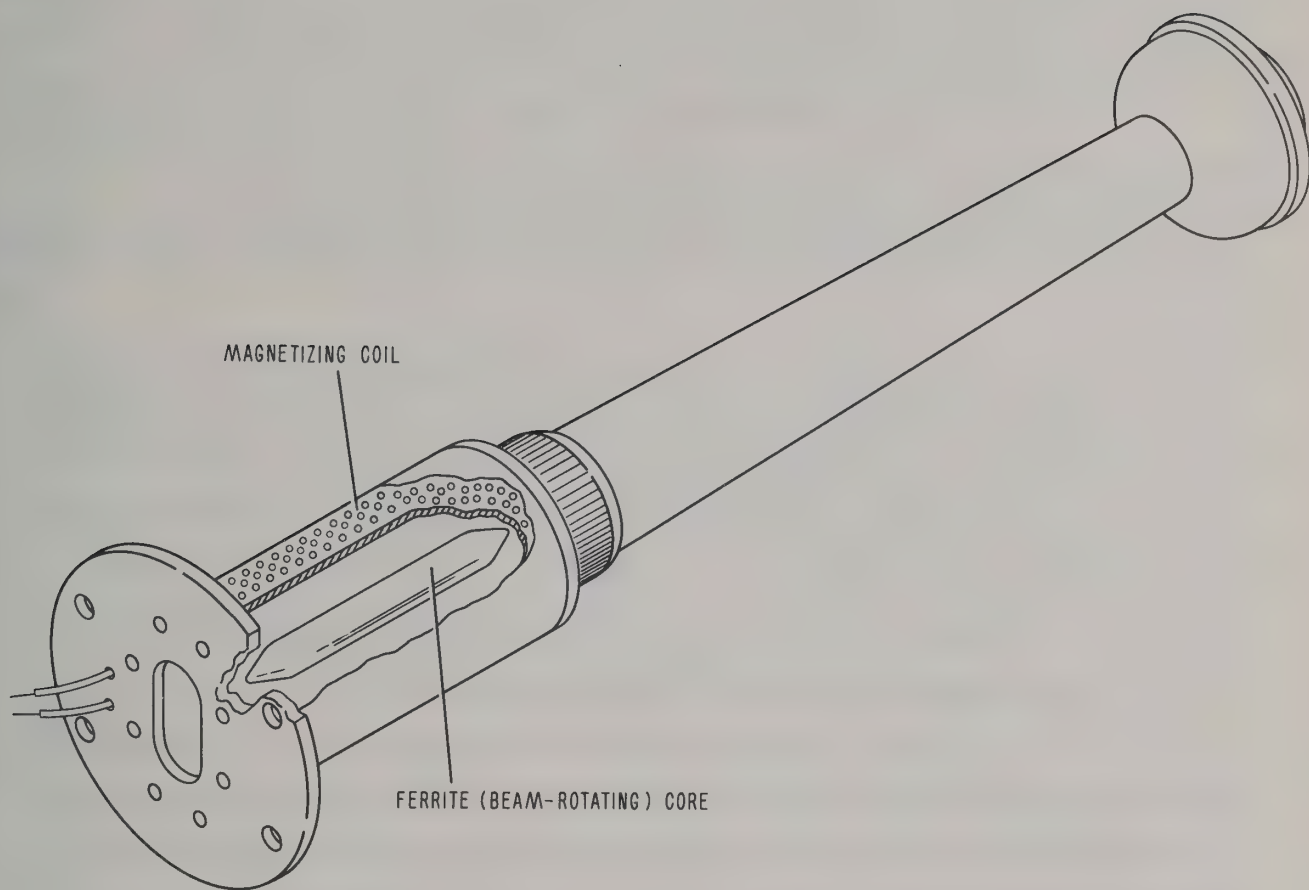


Figure 2-2. Feed Section of ANT-1() Antenna Waveguide System Showing Gyrator*
(Beam Rotator) Composed of Ferrite Core and Magnetizing Coil.
("*" Included with Feed Sections for X-band Antennas Only.)

The degree of microwave polarization rotation through the ferrite rod is determined by the physical length and magnetization of the ferrite and is not dependent directly on the applied magnetic field. Rotation of polarization is sensibly independent of the applied magnetic field after the ferrite reaches saturation.

The gyrator used rotates the polarization of the transmitted wave a nominal 90 degrees with the ferrite magnetized at or near saturation. This rotation of polarization results in a change from horizontal to vertical polarization of the radiated beam. The use for horizontal and vertical polarization is explained in paragraphs 2-2d and e.

(2) ENERGIZING THE GYRATOR. --The magnetizing coil of the gyrator is energized when the switch on the radar system's remote control box is placed in "MAP" position, thus applying 27.5 volts dc to pins S and Z of connector P2001 on the antenna. See the schematic diagram of the antenna (figure 9-7) for internal wiring connections to the gyrator.

When the gyrator is energized, the ferrite is magnetized at or near saturation by the magnetic field created by the magnetizing coil.

The gyrator is a non-reciprocal device; that is, for any degree of polarization rotation of the outgoing transmitted wave effected by the gyrator, a similar degree of polarization rotation will be experienced by the return (echo) wave as it passes through the ferrite. This polarization rotation of the incoming wave will be in the same direction as that experienced by the transmitted wave. The net result will be a received wave which has gone through a nominal 180 degrees of polarization rotation. The wave will again have horizontal polarization as required by the receiving system.

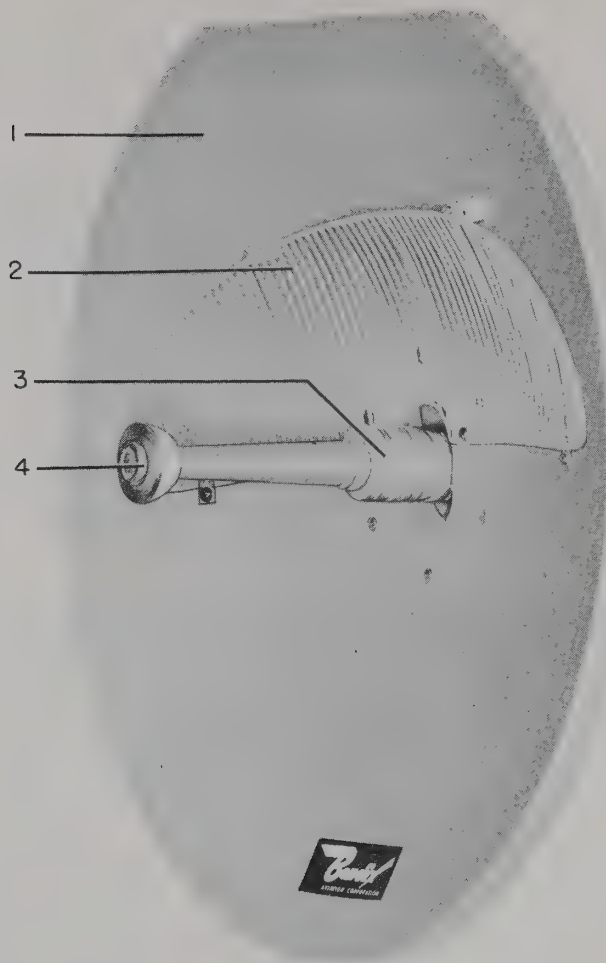
When the gyrator is de-energized, the ferrite retains a small percentage of magnetism. This residual magnetism in the ferrite rotates the polarization of the transmitted and received waves to some small degree, preventing a return to full horizontal polarization of the received wave. As an example, if the residual

magnetism in the ferrite causes 20 degrees of polarization rotation of the transmitted wave, the polarization of the received wave will be rotated 20 degrees in the same direction. The net result will be a received wave polarized 40 degrees away from the horizontal polarization required by the receiving system, and the received signal will suffer unnecessary attenuation.

To insure a passive ferrite when the gyrator is de-energized, a degaussing network, as described below, is incorporated in the gyrator electrical circuit.

(3) DEGAUSSER.--The degausser is an LC network in series with the magnetizing coil of the gyrator. When the gyrator is energized by the application of 27.5 volts dc, the voltage is applied to the gyrator magnetizing coil through an inductance in the degausser. Current flowing in the gyrator magnetizing coil must also flow in the degausser inductance, and this builds up a magnetic field around the inductor. A capacitor in the degausser shunts the d-c energizing voltage and is charged to the energizing voltage amplitude while the gyrator is energized. When the energizing voltage is removed, by opening the "MAP" switch on the remote control, the capacitor and inductor in the degausser and the magnetizing coil in the gyrator form a series resonant circuit. The circuit oscillates causing a quickly decaying a-c voltage to be applied across the gyrator magnetizing coil, thus degaussing the ferrite and rendering it satisfactorily passive.

d. REFLECTORS AND RADIATED BEAM CHARACTERISTICS.--Two standard reflectors are available: a 22-inch reflector, having an 8-inch focal length; and a 30-inch reflector, having a 10.6-inch focal length. Either reflector can be used on both X-band and C-band antennas. Owing to differences in operating frequency on X-band and C-band and the difference in focal length between 22-inch and 30-inch reflectors, a feed section must be used which is designed for the operating frequency of the radar and for the focal length of the reflector used. Table A, figure 9-10, sheet 1 of 3 lists the feed section to be used with each antenna type.



- 1 Parabolic reflector, truncated
- 2 Spoiler (beam shaping) grid
- 3 Ferrite magnetizing coil
- 4 Circular ring feed

Figure 2-3. Reflector Equipped With Spoiler (Wave Shaping) Grid, and Feed Section Equipped With Gyrator (Beam Rotator)

The reflector concentrates the r-f energy into a narrow pencil beam and directs the beam in both the azimuth and the elevation plane depending on the reflector attitude as explained in paragraph 2-6.

X-band antenna reflectors are equipped with spoiler grids (2, figure 2-3). The spoiler grid is invisible to horizontally polarized waves used during all normal weather mapping and beacon operations. The horizontally polarized waves pass right through the spoiler grid and are reflected only by the reflector (1). During ground mapping operations, when the gyrator is energized as explained in paragraph 2-2c, the rf radiated by the circular ring feed (4) has vertical polarization. A vertically polarized wave sees the spoiler grid as a relatively solid reflecting surface; the radiated beam is, therefore, composed of that portion reflected by the reflector (1) plus that portion reflected by the spoiler grid (2). The result is a radiated beam fanned in the vertical plane but retaining its narrow (pencil beam) characteristics in the horizontal plane. The vertical plane of the radiated beam then has csc^2 characteristics. The csc^2 beam provides relatively equal energy return from terrain between 50 and 5 nautical miles with the aircraft at an altitude of 20,000 feet and the antenna adjusted to optimum tilt.

Figure 2-4 illustrates the differences in range of ground illuminated by a pencil beam for various degrees of antenna tilt and the range of ground illuminated by a csc^2 beam at optimum tilt angle.

2-3. AZIMUTH DRIVE SYSTEM.

It is a mechanical function of the antenna to traverse the radiated beam in the azimuth plane, clockwise as viewed from above the antenna, at a rate of 15 ± 3 rpm.

Azimuth drive motor B2001 (9, figure 9-5) is a 6-pole, 2-phase, low inertia a-c motor which operates on 115 volts, 380-420 cps, and drives the antenna in azimuth rotation through a train of reduction gears (3).

Switch S2001 (16) is an on-off toggle switch in the a-c supply lead to azimuth drive motor B2001.

LEGEND, FIGURE 2-4.

DIAGRAM A

(Pencil-beam)

- a. Altitude of aircraft (20,000 feet)
- b. Antenna tilt angle (minus 15 degrees to center of pencil-beam)
- c. Beam width (3.8 degrees using 22-inch reflector)
- d. Range of ground illuminated (10.8 to 14.2 nautical miles, approximately)
- e. Antenna tilt angle (minus 5.7 degrees)
- f. Beam width (4.0 degrees using 22-inch reflector)
- g. Range of ground area scanned (24.6 to 50 nautical miles, approximately)
- h. Plane of flight path
- i. PPI display of ground area scanned (conditions a, b, c)
- j. PPI display of ground area scanned (conditions a, e, f)

DIAGRAM B

(Cosecant-squared beam)

- a. Altitude of aircraft (20,000 feet)
- *b. Antenna tilt angle (*must be adjusted to optimum tilt angle for most uniform display of terrain over the area of interest)
- c. Approximate inner cut-off range (five nautical miles)
- d. Approximate outer cut-off range (50 nautical miles)
- e. Range of ground scanned (5 to 50 nautical miles, approximately)
- f. Plane of flight path
- g. PPI display of ground area scanned (conditions a, b*)

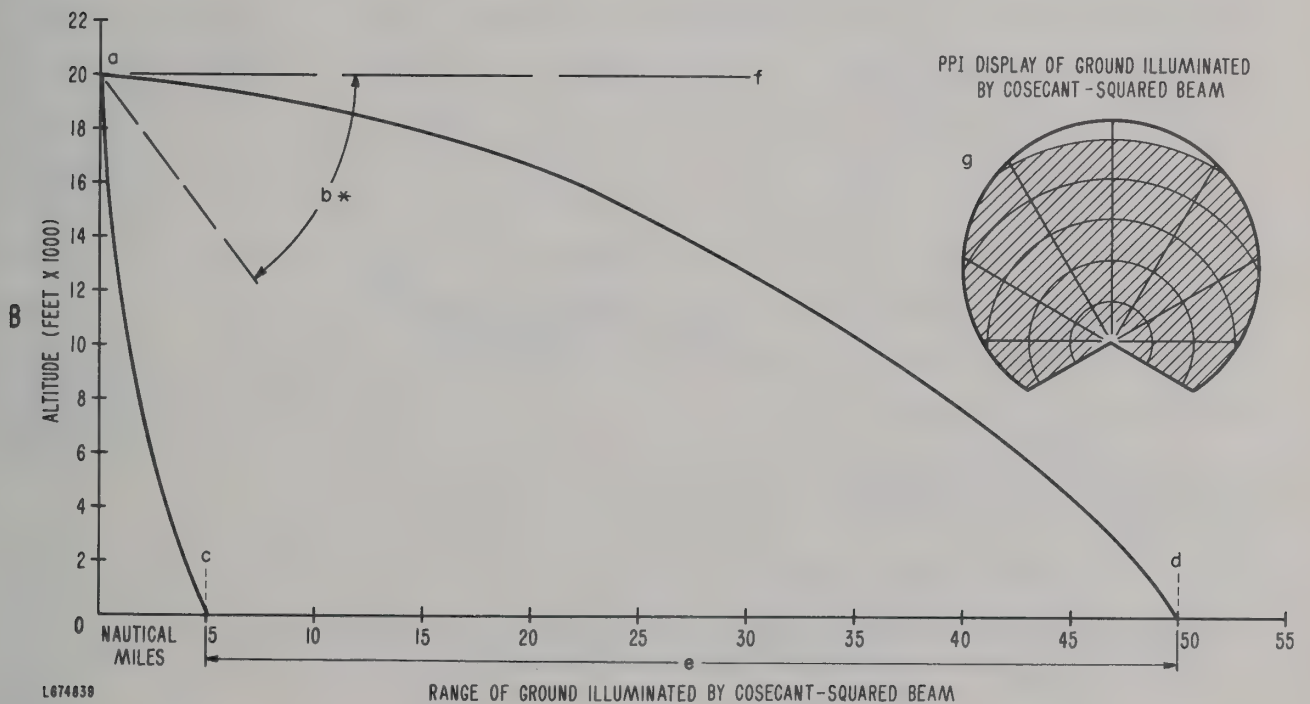
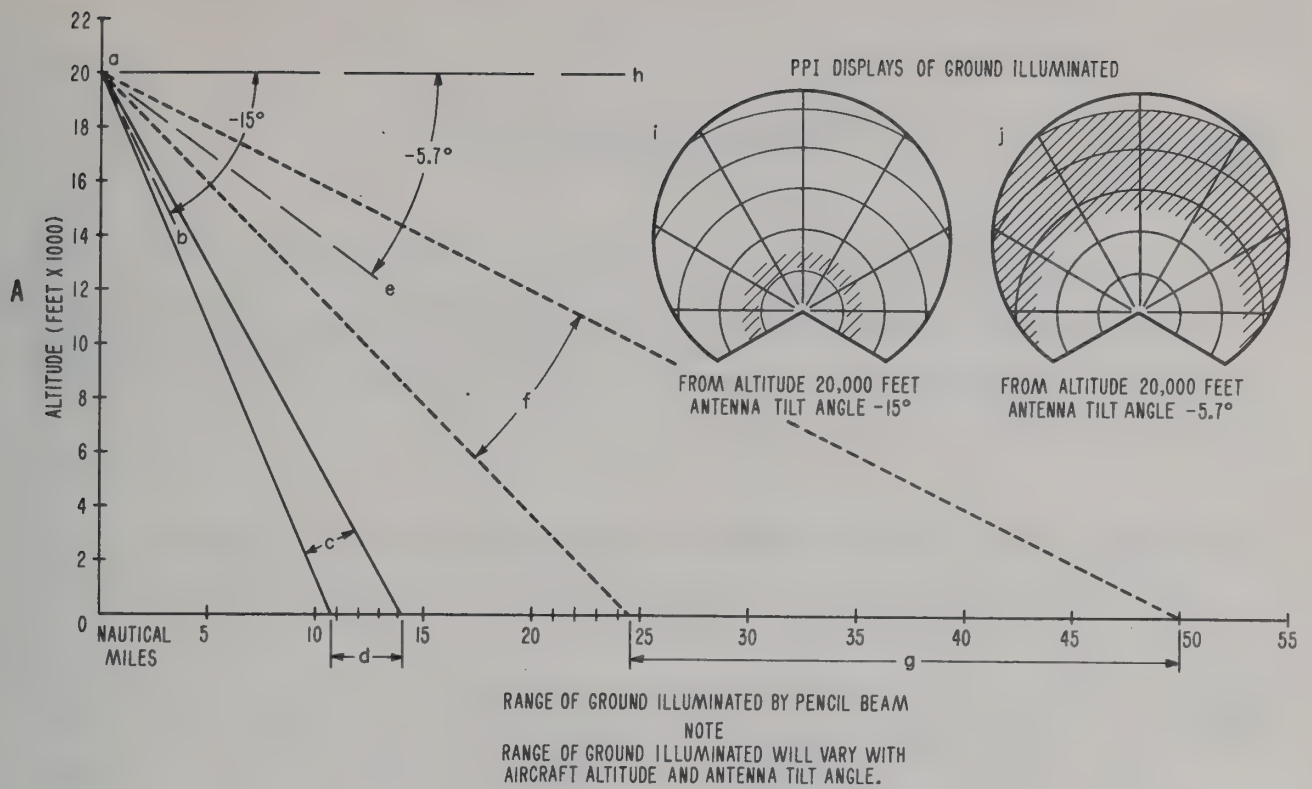
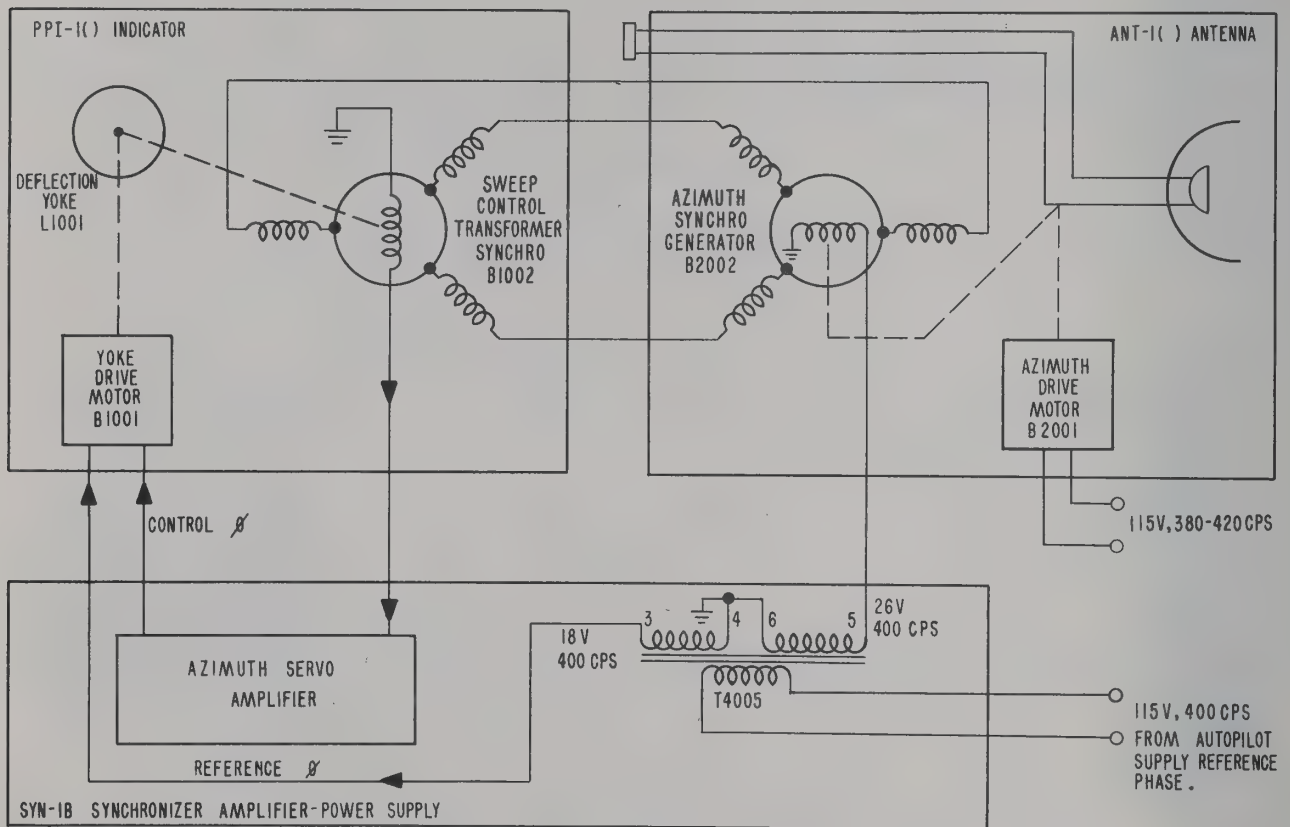


Figure 2-4. Comparison of Pencil Beam and Cosecant-Squared Beam Coverage

2-4. AZIMUTH SERVO SYSTEM.

The radar's azimuth servo system is a closed-circuit electromechanical control system having parts in three major units of the radar system, as shown in figure 2-5.



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Figure 2-5. Azimuth Servo System, Part of RDR-1 Airborne Radar System, Simplified Schematic Diagram

Azimuth synchro generator B2002 in the antenna (15, figure 9-5) is a three-phase synchro which acts as a synchro data generator. Its rotor is geared to the azimuth drive of the antenna and follows antenna rotation. Voltages induced in its

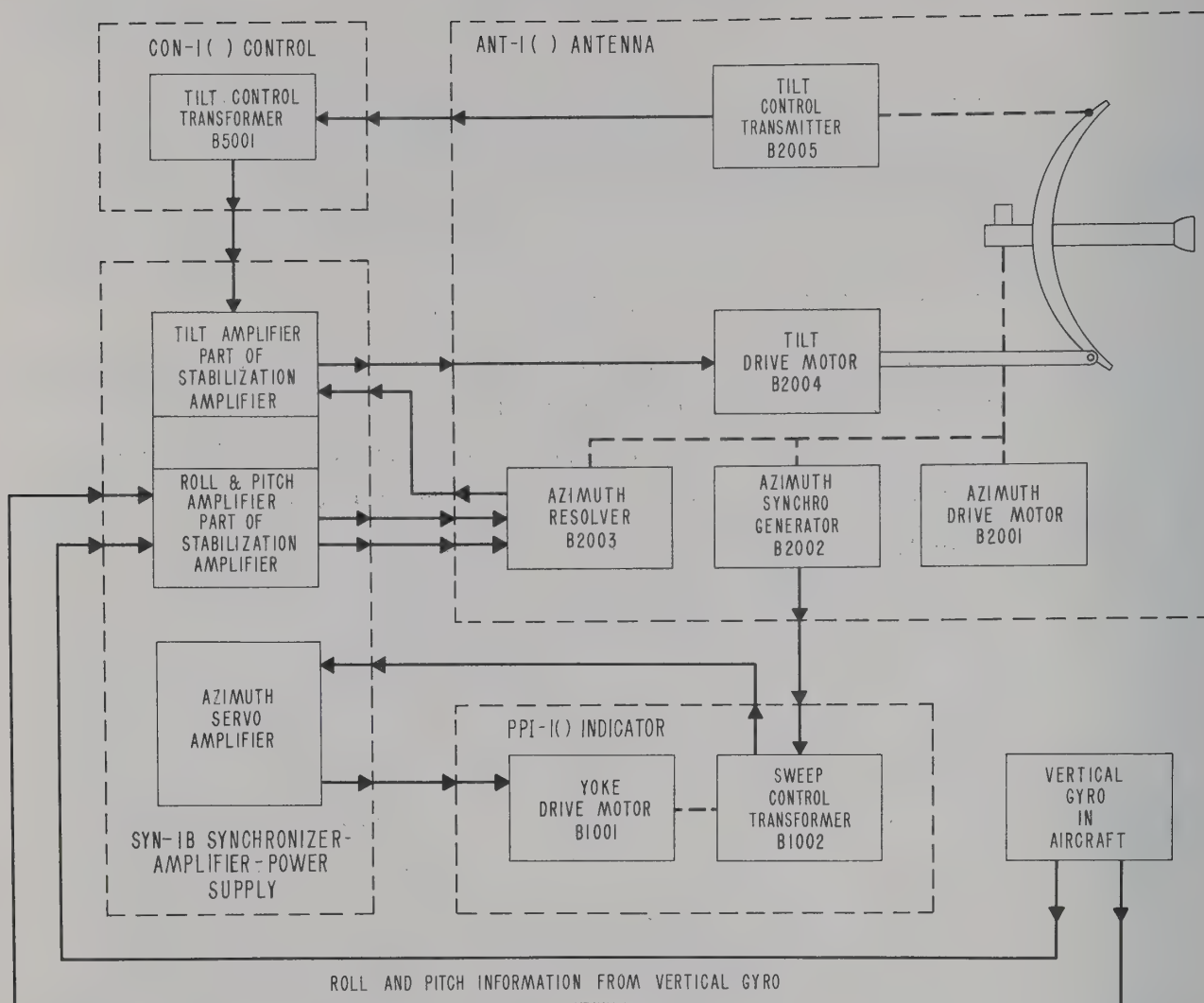
stator windings represent synchro data containing antenna azimuth bearing information. The synchro data so developed is coupled to sweep control transformer synchro B1001 in the PPI-1() Indicator.

In operation, the rotor of azimuth synchro generator B2002 is energized by a reference voltage of 26 volts, 400 cps. (See figure 2-5).

The rotor of azimuth synchro generator B2002 is directly geared to the azimuth drive of the antenna; thus the synchro receives a constantly changing shaft position. The synchro stator has three windings, 120 degrees apart and Y-connected. The rotor has one winding. The synchro behaves like a variable transformer in which the rotor is the primary and the stator windings are secondaries. The voltage induced in each of the three stator windings changes as the position of the rotor is altered. Azimuth synchro generator B2002 produces three constantly changing output voltages which are, in effect, synchro data for transmission to a remote point. The three stator outputs are connected directly to the three stator windings of sweep control transformer B1002 in each PPI-1() Indicator used. Therefore, sweep control transformer B1002 receives electrical synchro data, and since its rotor is geared directly to the indicator's deflection yoke L1001, it has its shaft (or rotor) set mechanically as deflection yoke L1001 is rotated. Sweep control transformer B1002 develops an output voltage across its rotor winding. The amplitude and phase of the voltage is determined by the angular difference between the actual rotor position and the position called for by the synchro data fed to its stator windings. It thus combines the functions of data receiver, follow-up and sensing element.

The rotor of sweep control transformer B1002 is set at the zero-voltage position, 90 degrees angular displacement from the maximum voltage position, as shown in figure 2-5. For any angular displacement from its zero-voltage position, an error voltage is induced in the rotor which is proportional to the sine of the angle of such displacement.

The output of sweep control transformer B1002 is fed to an azimuth servo amplifier in the SYN-1B Synchronizer-Amplifier-Power Supply where it is amplified,



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Figure 2-6. Servo System, Part of RDR-1 Airborne Radar System, Block Diagram

correction made for any phase shift in the process, and then fed to the control phase winding of yoke drive motor B1001 in the PPI-1() Indicator. The other winding of yoke drive motor B1001, designated as the reference phase, is connected to the same reference voltage source that feeds the rotor of azimuth synchro generator B2002 in the antenna.

The synchro system is so designed that the phase of the error voltage output of sweep control transformer B1002 will drive yoke drive motor B1001 in a direction calculated to reduce the error voltage toward zero. Since this error voltage-reducing process is continuous, when the system is in operation, and since the process is practically instantaneous, the sweep trace on the face of the indicator will, at every instant, indicate the azimuth position of the antenna.

2-5. STABILIZATION SERVO SYSTEM.

The radar's stabilization servo system incorporates remote control of antenna tilt with antenna line-of-sight stabilization.

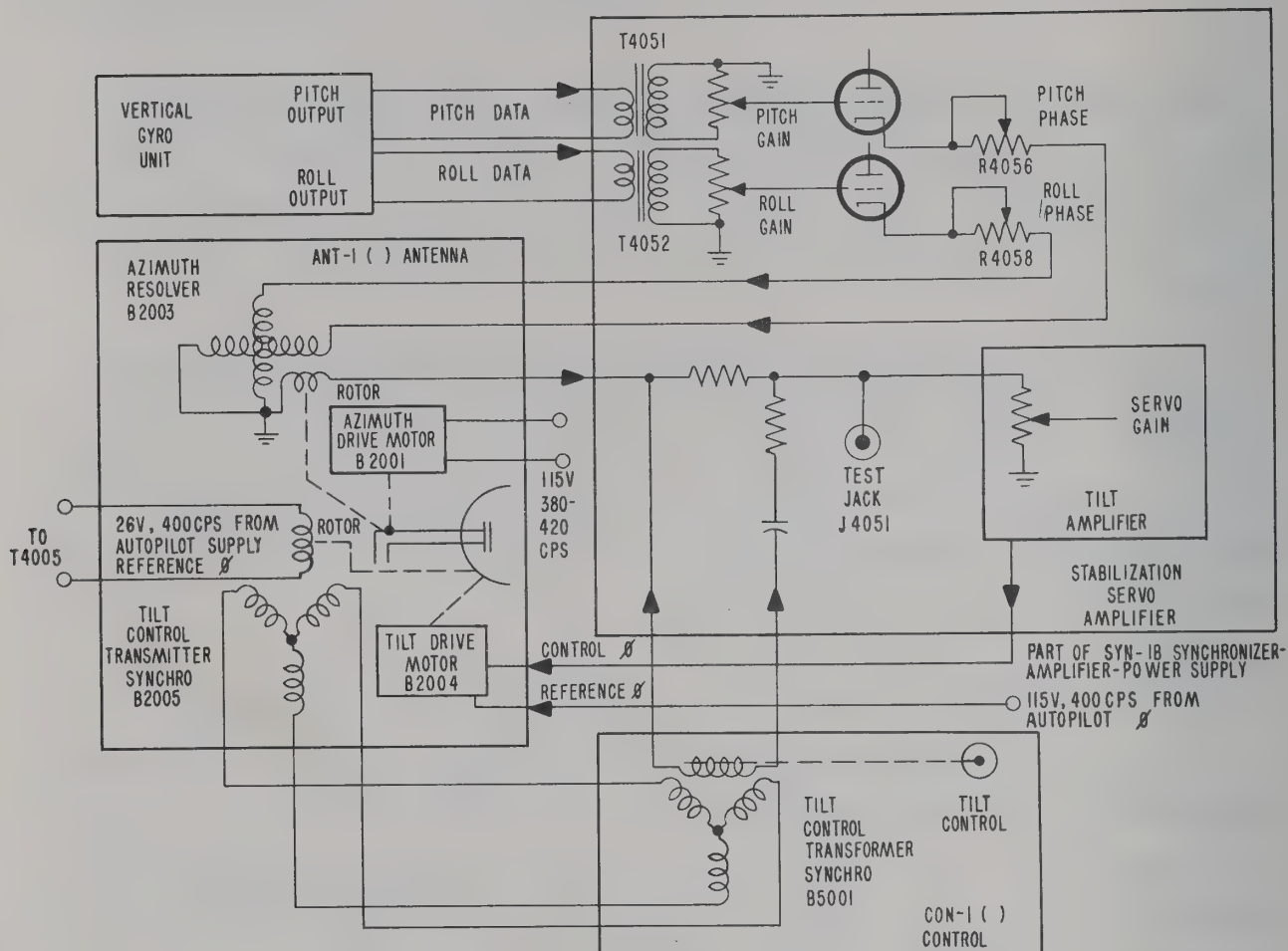
Parts of the stabilization servo system are contained in three major units of the radar system. It is a combined open and closed circuit, electromechanical control system which requires roll and pitch information from the aircraft's vertical gyro unit to achieve antenna stabilization.

Figure 2-6 is a block diagram of the entire servo system of the radar set.

Figure 2-7 is a simplified diagram of the stabilization servo system showing the inter- and internal connections of the system.

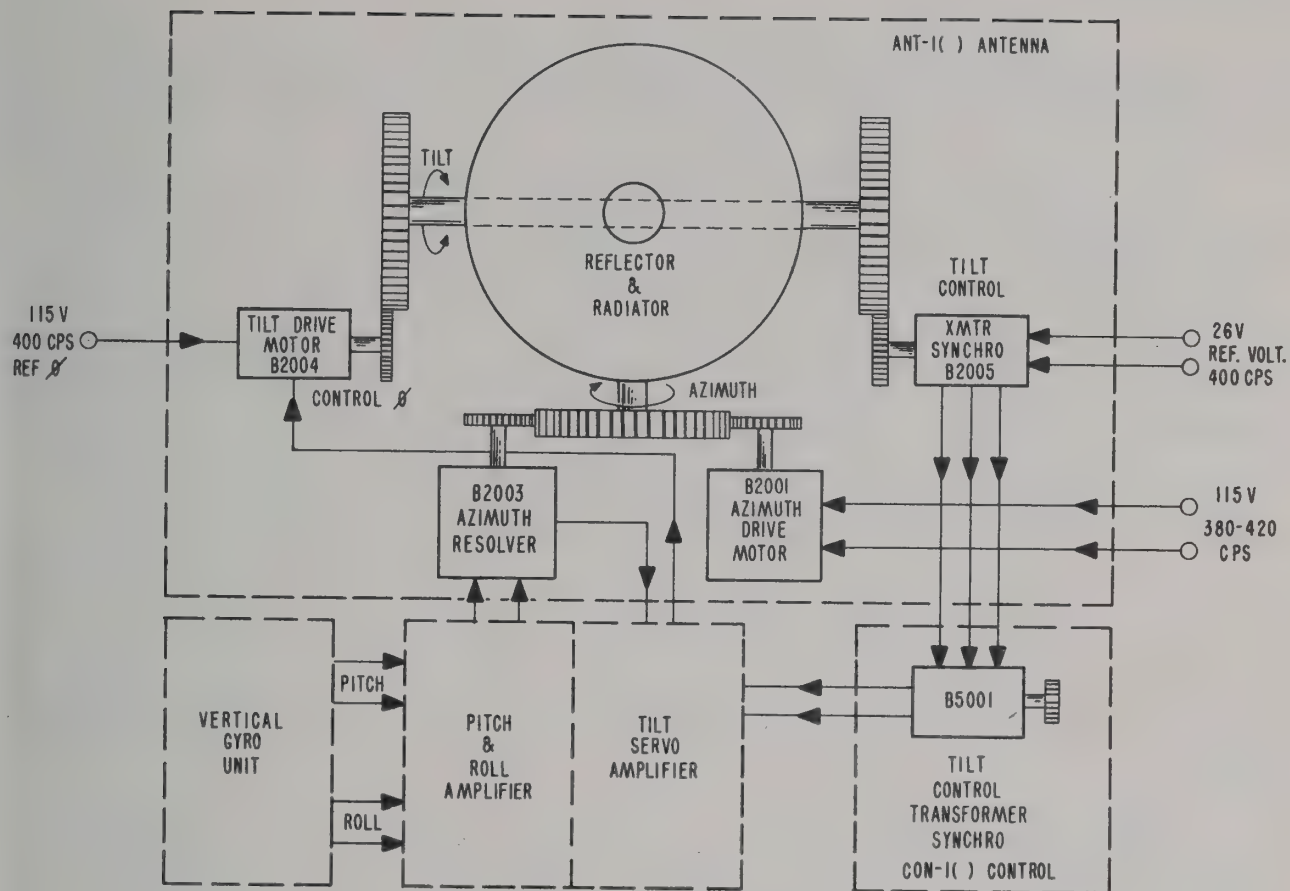
Figure 2-8 is a diagram of the stabilization servo system illustrating the electrical and mechanical linkage of the system in simplified form.

Data from the aircraft's vertical gyro unit are fed to the stabilization servo system which automatically corrects the angle of antenna tilt to counteract the pitching and rolling of the aircraft. The stabilization prevents the scan from being



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Figure 2-7. Stabilization Servo System, Part of RDR-1 Airborne Radar System, Simplified Schematic Diagram



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Figure 2-8. Stabilization Servo System, Part of RDR-1 Airborne Radar System, Electromechanical Diagram

disturbed by limited maneuvers of the aircraft and ensures against impairment of the scope presentation by such maneuvers.

Line-of-sight stabilization functions to approximately plus and minus 25 degrees of beam tilt. The center of antenna tilt limits (zero-degree tilt) provides beam coverage in the horizontal plane. For any preset tilt angle, other than zero tilt, the amount of tilt manually introduced subtracts from the degree of antenna travel possible in the direction of preset tilt and adds an equal amount to the travel possible in the opposite direction. As an example: if the tilt angle of the antenna is manually preset to a ten-degree angle down from the horizontal to provide a certain amount of ground coverage, in level flight the beam will be radiated downward at an angle of ten degrees from the horizontal. The stabilization system will maintain this angle of radiation with respect to the horizontal for any pitch angle of the aircraft within the limits of: nose up 15 degrees and nose down 35 degrees. In addition, the stabilization system will compensate for roll attitudes of the aircraft within the stabilization limits.

Voltages representing the roll and pitch angles of the aircraft are obtained from the aircraft's vertical gyro unit and are fed, through amplifiers, to the stator windings of a two-phase resolver (5, figure 9-5) mounted in the antenna. The relative azimuth angle of the antenna is introduced as the mechanical rotation of the resolver rotor.

In operation, the antenna is rotated in azimuth by azimuth drive motor B2001 (9, figure 9-5). The rotor of azimuth resolver B2003 (5) is geared to the azimuth drive of the antenna at a gear ratio of 1:1 and follows antenna rotation.

Azimuth resolver B2003 is a two-phase synchro that has two stator windings spaced 90 degrees apart and two rotor windings spaced 90 degrees apart. Only one rotor winding is used in this application. The resolver acts like a variable transformer having two primaries (stators) placed at right angles to each other, and one rotatable secondary (rotor) capable of maximum coupling with either of the primaries

for each 90 degrees of rotation. The pitch output of the aircraft's vertical gyro, after amplification, is fed to one stator winding of the resolver, and the roll output, after amplification, is fed to the other stator winding.

The output voltage from the resolver rotor winding represents the approximate antenna tilt angle correction necessary at any instant to compensate for roll and pitch of the aircraft. This voltage is added to the rotor output voltage from the manually operated tilt control transformer B5001 in the CON-1() Control and the resulting voltage is the vectorial sum of the two voltages. The resulting voltage is amplified in the stabilization servo amplifier section of the SYN-1B Synchronizer-Amplifier-Power Supply and is used to control the tilt angle of the antenna through tilt drive motor B2004 (13, figure 9-3).

Tilt transmitter synchro B2005 on the antenna (6, figure 9-3) is a three-phase synchro transmitter; its rotor is geared at a ratio of 21:12 (1.75:1) to the tilt axis of the antenna. The rotor is energized with a reference voltage of 26 volts, 400 cps, from transformer T4005 in the SYN-1B Synchronizer-Amplifier-Power Supply, and acts like the primary of a transformer. A voltage is therefore induced in each of the three stator windings of tilt transmitter synchro B2005. These three induced voltages vary as the tilt angle of the antenna changes; they represent synchro data to be transmitted to a remote point.

The three stator winding outputs (synchro data) of tilt transmitter synchro B2005 are fed to the three stator windings of tilt control transformer synchro B5001, in the CON-1() Control unit, wherein the field of the transmitter rotor is reproduced.

With no roll or pitch input to azimuth resolver B2003, the antenna at zero-degree tilt, and the tilt control transformer B5001, in the CON-1() Control, manually set to indicate zero-degree tilt, no error voltage is induced in the rotor of tilt control transformer B5001 in the CON-1() Control. This is so because the rotor of B5001 is set at a 90-degree angular displacement from the position called for by the synchro data and this is the zero (no-voltage) position for the rotor of tilt control transformer B5001.

Assuming a condition of no error voltage output from the rotor of tilt control transformer B5001 in the CON-1() Control (which means that the rotor of B5001 is zeroed with respect to the rotor of tilt transmitter synchro B2005 in the antenna), any angular movement of either rotor will cause an error voltage to be induced in the rotor of tilt control transformer B5001. This induced (error) voltage will be proportional to the sine of the angle of any such angular difference existing between the position of the tilt transmitter synchro rotor with respect to its zero position and the position of the tilt control transformer rotor with respect to its zero position.

Finally, one winding of the two-phase tilt drive motor B2004 (13, figure 9-3), in the antenna, is connected to the reference phase of the 115-volt, 400-cps primary power supply. This winding is designated as the reference phase. The second winding, designated as the control phase, is energized by the error voltages developed in tilt control transformer synchro B5001. The error voltages are first amplified in the tilt servo amplifier section of the SYN-1B Synchronizer-Amplifier-Power Supply and then fed as a control voltage to tilt drive motor B2004 (13, figure 9-3) in the antenna. At every instant the control voltage will be of proper phase and amplitude to drive the motor in the direction required to maintain a constant beam radiation angle throughout the entire 360 degrees of antenna rotation.

Switch S3002 (4, figure 9-5) is a double-pole, off-on toggle switch connected in series with the energizing circuits of tilt drive motor B2004. One pole of switch S3002 is in the 115-volt reference voltage circuit; the other pole is in the control voltage circuit of tilt drive motor B2004.

2-6. MECHANICS OF REMOTE CONTROL OF ANTENNA TILT.

Figure 2-9 illustrates the mechanics associated with the remote control of antenna tilt. The additional components of the servo system required for antenna stabilization have been omitted from figure 2-9 to simplify the illustration. All of the components shown, however, are also a part of the stabilization servo system.

THEORY OF OPERATION

Section II Paragraph 2-6

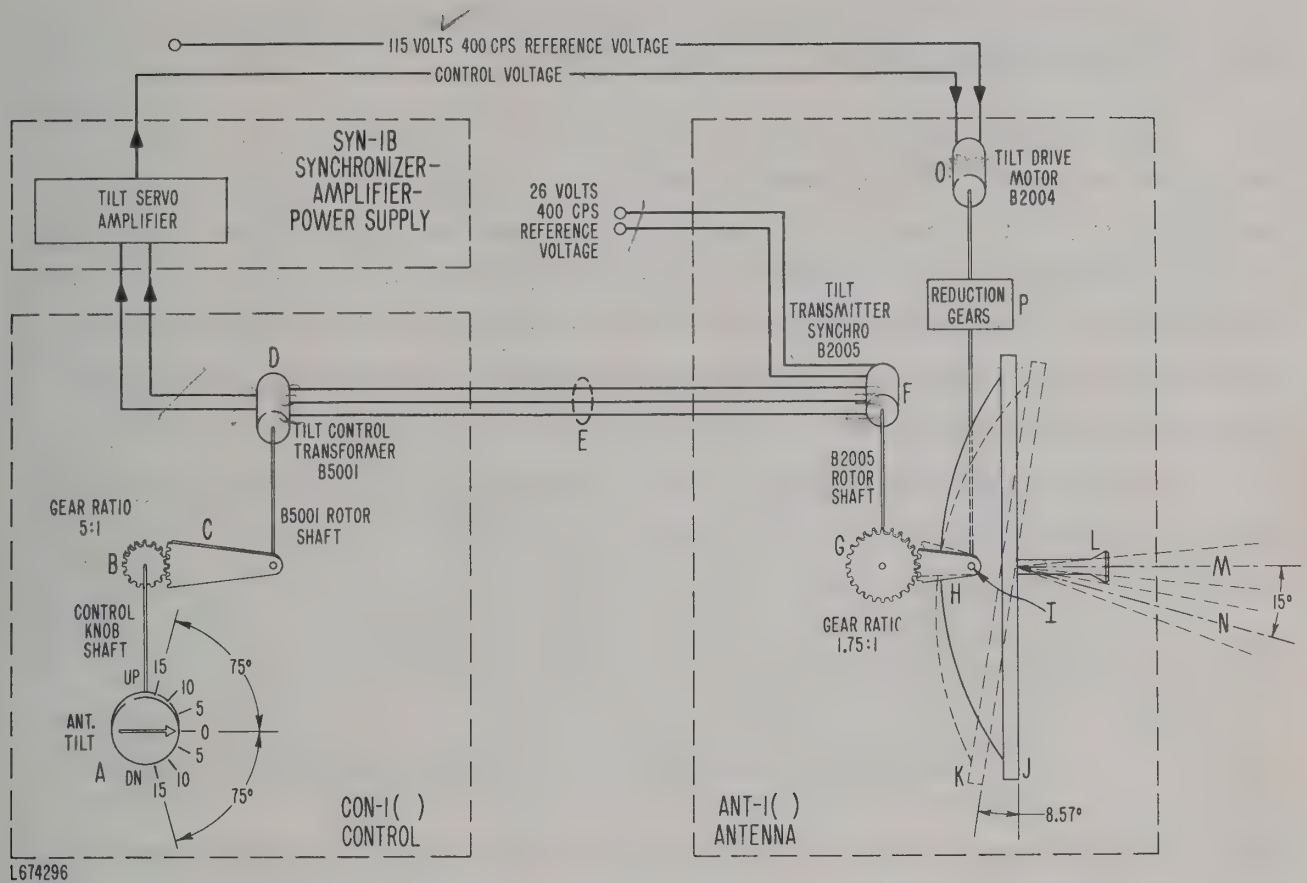


Figure 2-9. Servo Linkage for the Remote Control of Antenna Tilt, Part of RDR-1 Airborne Radar System

The important features illustrated in figure 2-9 are the gear ratios (BC) and (GH) and the mirror effect of the parabolic reflector of the antenna.

It should be noted that when the ANT-TILT control knob (A, figure 2-9) is set to indicate any degree of antenna tilt, within the tilt limits inscribed on the CON-1() Control Panel, the radar beam is radiated at the angle indicated, with respect to the horizontal plane. This is true for level flight when no roll or pitch correction voltages

are being supplied to the servo system by the aircraft's vertical gyro, and this condition is assumed throughout this paragraph.

The tilt angle scale inscribed on the front panel of the CON-1() Control ranges from 15 degrees "UP," through zero, to 15 degrees "DOWN" for a total of 30 degrees of tilt calibration. To facilitate more accurate manual setting of the desired tilt angle the 30 degrees of calibration are expanded, five-to-one, to occupy a 150-degree arc around the "ANT-TILT" control knob (A) on the CON-1() Control. Therefore, the "ANT-TILT" control knob must be rotated an actual 75 degrees to indicate a 15-degree change in the radiation angle of the radar beam.

In level flight, with the arrow on the "ANT-TILT" control knob (A) indicating zero degree and the antenna reflector (J) positioned at zero degree in tilt, tilt control transformer B5001 in the CON-1() Control is electrically zeroed with tilt transmitter synchro B2005 in the antenna. The servo system is then static since no error voltage exists, and the radar beam (M) is radiated in the horizontal plane.

Now, when the "ANT-TILT" control knob (A) is turned an actual 75 degrees, the arrow on the knob will indicate an antenna tilt angle of 15 degrees. Because of the 5:1 ratio between the pinion gear (B) on the control knob shaft and sector gear (C) on the tilt control transformer rotor shaft the rotor of tilt control transformer B5001 (D) will be rotated an actual 15 degrees, and an error voltage will be developed in the rotor. The error voltage thus developed represents an order calling for the antenna to tilt the radar beam 15 degrees from the horizontal plane.

To execute the order so developed the error voltage is fed to and is amplified by the tilt servo amplifier section of the SYN-1B Synchronizer-Amplifier-Power Supply. From there it is fed as a control voltage to the control phase of tilt drive motor B2004 (O). The tilt drive motor then drives the antenna reflector through reduction gears (P) from reflector position (J) to reflector position (K). Note that the radar beam is deflected 15 degrees, from position (M) to position (N), while the antenna reflector is tilted only 8.57 degrees (approximately); the ratio of beam deflection to reflector tilt is 1.75:1. This ratio is effected by maintaining the antenna feed

(L) in a fixed position while tilting the antenna reflector, causing the radar beam to be deflected 1.75 times the degree of reflector tilt; i.e., $1.75 \times 8.57 \text{ degrees} = 14.9975 \text{ degrees}$.

Since the mirror effect of a fixed feed and tilted reflector causes the degree of radar beam deflection to exceed the degree of reflector tilt, some means of compensation is required to cause the error voltage to diminish to zero when the radar beam reaches the desired degree of tilt. This compensation is supplied by the 21:12 (1.75:1) gear ratio between the sector gear (H), the hub of which is fixed to the tilt axis (I) of the antenna, and drive gear (G), which is attached to the rotor shaft of the tilt drive transmitter synchro B2005 (F). When the antenna reflector tilts 8.57 degrees, segment gear (H) moves 8.57 degrees with the reflector and drives the rotor of B2005 15 degrees, through drive gear (G). Because the rotor of tilt transmitter synchro B2005 (F) has now moved 15 degrees in angular rotation, it is again electrically zeroed with the rotor of tilt control transformer B5001 (D), thereby reducing the (error) voltage to zero. The system is once again static but the radar beam is now radiated at a tilt angle 15 degrees from the horizontal plane.

2-7. TILT DRIVE SYSTEM.

Tilt drive motor B2004 is a six-pole, two-phase, low-inertia a-c motor which operates with a reference voltage of 115 volts, 380-420 cps, supplying one phase and a 380-420 cps control voltage of varying phase and amplitude supplying the second phase. In operation the reference voltage is persistent. The control voltage is automatically applied, as required for antenna stabilization, through the stabilization servo system, which is described in paragraph 2-5.

The tilt drive motor (13, figure 9-3) drives the reflector mounting assembly (7) through a rod and bearing linkage (9 and 11) and an assembly of reduction gears (12).

Included with the reduction gear assembly (12) are two adjustable spring-loaded vertical travel buffers and a fixed vertical travel stop. The spring-loaded buffers

retard the vertical travel speed of the reflector as it approaches a predetermined maximum (plus or minus) tilt angle. The fixed stop restricts reflector travel to safe limits after the retarding action of the buffers. The fixed stop keeps the reflector from slamming against structural parts of the antenna to prevent possible damage to the antenna. Damage might occur during certain maneuvers of the aircraft if the stabilization servo system travels the reflector beyond normal operating limits, or when the reflector is manually tilted, or during transit if the reflector is not otherwise cushioned against excessive tilt.

The possibility of damage to the reduction gear assembly (12) is minimized by the action of the spring-loaded buffers since the vertical travel speed of the reflector and of the tilt drive motor is reduced by buffer action before the fixed stop is reached.

All electrical connections to tilt drive motor B2004 (13), tilt transmitter synchro B2005 (6), and to the degausser network (on X-band antennas) are made to terminal boards TB2003 and TB2004 (5 and 10). The terminal boards are connected to the electrical input connector P2001 (2) through a slip ring assembly in the antenna mounting base.

SECTION III INSTALLATION

3-1. GENERAL.

Instructions covering the installation of Bendix type ANT-1B() and ANT-1E() Antennas are included in the RDR-1 (X-band) Airborne Radar System Instruction Book I. B. 732.

Instructions covering the installation of Bendix type ANT-1C() and ANT-1D() Antennas are included in the RDR-1 (C-Band) Airborne Radar System Instruction Book I. B. 733.

Dimensional outline drawings of C-band antenna types ANT-1C() and ANT-1D() and of X-band antenna types ANT-1B() and ANT-1E() are included in this handbook (figures 3-2 and 3-3).

A part of the installation instructions included in the system instruction books (I. B. 732 and I. B. 733) is repeated in this handbook for quick reference.

3-2. ANTENNA INSTALLATION.

a. GENERAL. --The antenna must be installed in the nose section of the aircraft in front of the forward bulkhead. It may be mounted to the forward bulkhead by using the extension mounting bracket (4, figure 3-1), or special brackets may be designed and fabricated by the user to allow antenna installation to be made under unusual mounting conditions. Versatility of mounting is increased by the inclusion of two tapped mounting holes in each side of the antenna mounting base (1, figure 3-1) to accommodate rail mounting or support, as well as by the five optional positions of the waveguide input flange (detail A, figure 3-1), and by the option of mounting the antenna in either an upright or inverted position. Inverted mounting requires internal wiring changes as outlined in paragraph 3-2b.

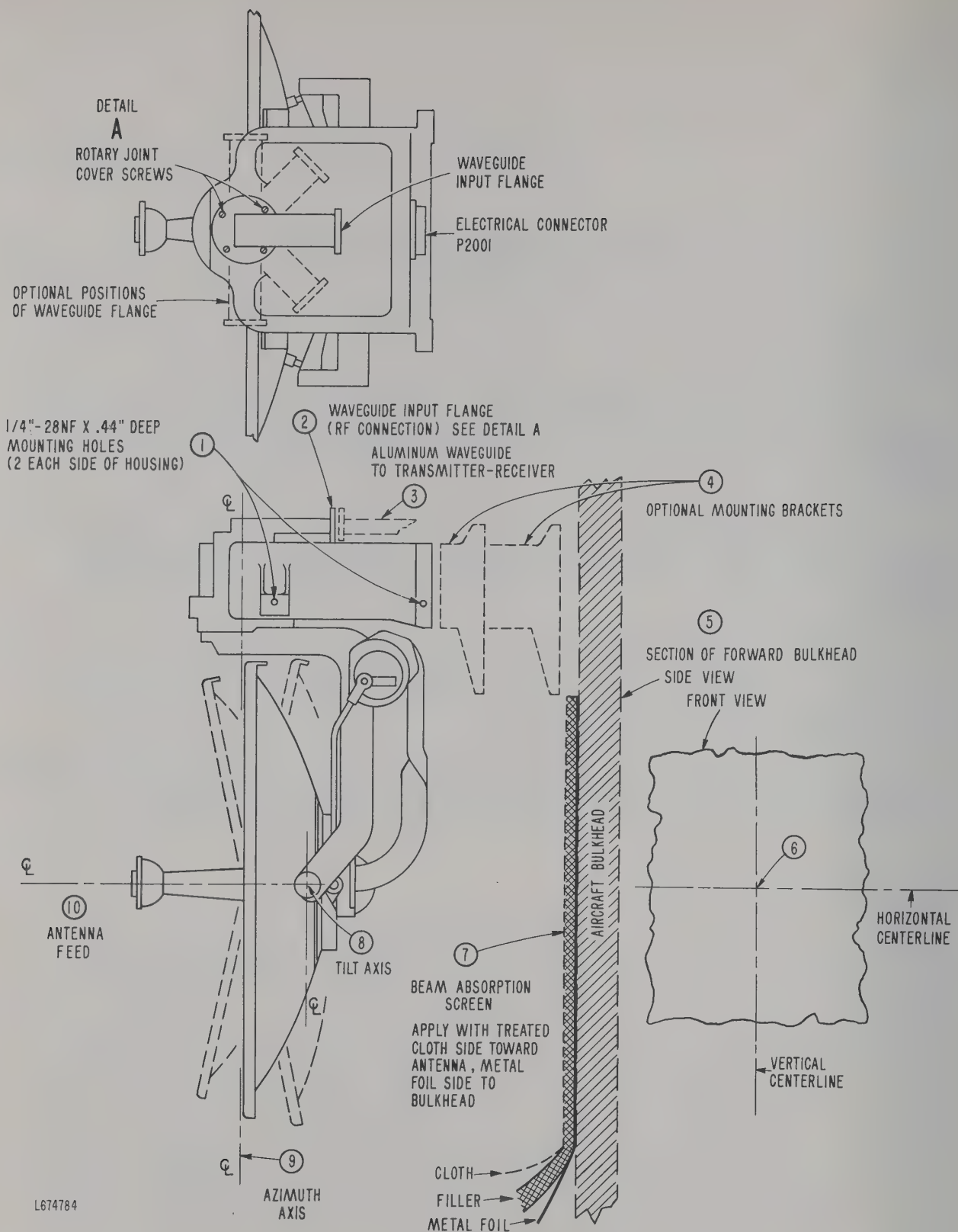


Figure 3-1. Antenna Mounting Data, Referenced Detail Drawing

INSTALLATION

Section III Paragraphs 3-2a to 3-2c

The ANT-1() Antenna is designed to rotate from right to left when viewed facing the reflector. The unit is wired for proper rotation, synchronization, and stabilization when mounted in the aircraft with the mounting base above the reflector. In some installations it may be necessary or advantageous to mount the antenna in an inverted position, that is, with the reflector above the mounting base. When this condition prevails, modifications to the wiring of the antenna will be necessary to maintain proper rotation, synchronization, and stabilization.

Refer to paragraph 3-2b when these modifications are necessary.

b. SHOCKMOUNTING AND VENTILATION. --Shockmounting is not required. The antenna is designed to operate in the unpressurized nose section of aircraft. Ventilation is not important.

c. ORIENTATION. --The mounting position of the antenna must satisfy the following conditions: Centerline of antenna feed (10, figure 3-1) must be located at aircraft centerlines (6) or within three inches below horizontal centerline on vertical centerline; azimuth spin axis of antenna (9) must parallel spin axis of the stabilizing vertical gyro; tilt axis of antenna (8) must parallel pitch axis of aircraft.

To ensure that targets are displayed in their proper relative positions with respect to the aircraft, the radar beam must radiate forward, perpendicular to the pitch axis of the aircraft, and in the plane of flight path when the antenna is positioned at zero degrees in both azimuth and tilt.

The antenna stabilization system will function properly only when the azimuth spin axis of the antenna parallels the spin axis of the stabilizing vertical gyro. Should an ambiguity exist between the two spin axes, an inherent error is developed in the system. This error is evidenced by uneven azimuth illumination of terrain as the antenna revolves. This condition is undesirable and may cause some confusion when interpreting the radar display. Therefore, it is important that the antenna and gyro spin axis be in coincidence (both pitch and roll planes) when the antenna is being mounted. The same reference criterion for mounting the gyro should be employed for leveling and mounting the antenna.

d. MODIFICATIONS FOR INVERTED MOUNTING. --When it is necessary to mount the antenna in an inverted position, that is, with the reflector above the antenna scanner housing, the following procedure should be followed to accomplish the necessary modifications before installing the antenna.

NOTE

The following procedure applies to both X-band and C-band antennas; however, X-band antennas equipped with gyrators (beam rotators) and spoiler grids should be modified at the factory. The spoiler grid on X-band antennas must be repositioned, and to insure an optimum csc^2 beam pattern, the grid must be adjusted on an antenna range.

Both X-band and C-band antennas will be supplied pre-modified for inverted mounting when so specified on purchase order.

Step 1. Remove the six screws from the antenna scanner housing top cover and remove top cover to expose terminal boards TB2001 and TB2002 within the housing.

Step 2. Remove the four screws from the terminal board cover above the tilt control transmitter synchro B2005 and remove the cover to expose terminal board TB2003.

Step 3. Interchange the red and natural-colored leads, from the azimuth drive motor B2001, at terminals 1 and 2 of terminal board TB2001.

Step 4. Interchange the blue and yellow stator leads, from the azimuth synchro generator B2002, at terminals 5 and 6 of terminal board TB2001.

Step 5. Interchange the blue and yellow leads, from the azimuth resolver B2003, at terminals 6 and 7 of terminal board TB2002.

INSTALLATION

Section III
Paragraphs 3-2d to 3-2e

Step 6. Interchange the blue and yellow stator leads, from the tilt control transmitter synchro B2005, at terminals 4 and 5 of terminal board TB2003.

Step 7. Interchange the No. 1 red lead on terminal 1 with the No. 2 black lead on terminal 2 of terminal board TB2003. Leave the No. 1 black lead on terminal 1. The two leads interchanged are rotor leads from the tilt control transmitter synchro B2005.

Step 8. Reinstall cover on terminal board TB2003.

Step 9. Reinstall top cover on antenna scanner housing.

NOTE

When the antenna is mounted in the aircraft, the spoiler grid attached to the reflector must be located above the antenna feed. To accomplish this the spoiler grid must be rotated 180 degrees from its present position on the reflector. The reflector is supplied with a duplicate set of grid mounting holes, properly spaced, to facilitate this modification.

Step 10. Note spacing between grid and reflector and location of spacers.

Step 11. Remove spoiler grid from reflector by removing the hardware holding it in place.

Step 12. Rotate spoiler grid 180 degrees around antenna feed and secure it to reflector with the same hardware and spacers removed in step 11. Make certain that spacers are properly positioned to insure the same spacing between grid and reflector as noted in step 10. (Refer to note preceding step 1.)

e. WAVEGUIDE (R-F) CONNECTION.--The waveguide input flange (1, figure 9-3), shown oriented to the rear of the antenna scanner housing, can be oriented 45 degrees and 90 degrees to the right or left of the position shown. (See detail A, figure 3-1.) The five optional positions allow r-f connection to the antenna to be made from as many angles and help simplify the aircraft waveguide installation.

To change the input angle of the waveguide input flange, it is only necessary to remove the four screws from the top of the rotary joint cover (detail A, figure 3-1); turn the waveguide input flange to the desired 45- or 90-degree angle without lifting the cover; align the screw holes in the housing, shims, and cover; and replace the screws.

f. ELECTRICAL CONNECTIONS.

(1) GENERAL. --All electrical connections to the antenna, except r-f, are made through receptacle P1001, a type AN-3102A-36-7P connector, mounted on the rear of the antenna scanner housing. The mating plug required can be either a type AN-3106-36-7S straight connector or a type AN-3108-36-7S angle (90-degree) connector.

(2) MATCHING TRANSFORMER FOR ANTENNA STABILIZATION. --The RDR-1 Airborne Radar System Instruction Books I. B. 732 and I. B. 733 make reference to "isolation" transformers for use when the ANT-1() Antenna is stabilized by the Sperry A12 Autopilot vertical gyro. The transformer mentioned (Sperry Part Number 661711) functions to reduce each output (pitch and roll) of the vertical gyro to match the input requirements of the RDR-1 Airborne Radar System stabilization system. However, Sperry no longer recommends this transformer for matching the gyro signal to the radar. Instead, Sperry now recommends a later and more suitable transformer identified as Sperry Part Number 616215.

The specifications of this later transformer are as follows:

Primary input (taps 1-2) = 207 millivolts per degree

Secondary No. 1 output (taps 3-4) = 115 millivolts per degree

Secondary No. 2 output (taps 5-6) = 50 millivolts per degree

When connected into the RDR-1 Airborne Radar System, secondary No. 1 (taps 3-4) functions as the primary input, and secondary No. 2 (taps 5-6) functions as the output, leaving the normal primary (taps 1-2) unused.

INSTALLATION

Section III
Paragraphs 3-2f to 3-2h

This transformer (Sperry Part Number 616215) is available as an on-shelf item from the Sperry Gyroscope Company, Great Neck, New York.

The Sperry A12-I Autopilot includes an isolation transformer which has the required output. No additional transformer is needed when the model A12-I is used to stabilize the ANT-1() Antenna.

g. PRESSURIZATION.--The antenna is designed to operate with internal waveguide air pressures from sea level to 16,000 feet. The mechanical design of the rotating joint in the antenna is such that it restricts air leakage to less than two cubic inches per minute when the pressure differential between the inside and outside of the waveguide is one atmosphere.

Air is bled into the waveguide installation, through a small hole in the spring-loaded waveguide adaptor on the transmitter shockmount, maintaining the air pressure within the waveguide installation at cabin pressure.

Since the antenna is installed in the nose section of the aircraft, which is not normally pressurized, the antenna is designed to operate at external pressures from sea level to 40,000 feet. To prevent air leakage between the pressurized cabin and an unpressurized nose section, the electrical (operating) and r-f transmission lines feeding the antenna must be brought into the nose section of the aircraft, utilizing airtight seals at the bulkhead feedthrough.

h. BEAM ABSORPTION SCREEN.--The aircraft bulkhead to which the ANT-1() radar antenna mounts must be shielded with an r-f absorber. The McMillan type T-XJ-2 is satisfactory for X band and McMillan type T-MC-2 for C band.

The tinfoil side of the absorption material must be mounted toward the bulkhead. The recommended bonding agent is either Pliobond M-20 or Cycleweld C-14. McMillan states that the absorption material, when edge sealed, "is impervious to the effects of temperature, moisture, hydraulic fluids, gasoline and similar solvents." The recommended edge sealer, Bostik #4585, should be used on all edges of the absorption material (7, figure 3-1).

INSTALLATION

i. RADOME.--To maintain the aerodynamic characteristics of the aircraft and yet allow satisfactory radar beam radiation through the nose of the aircraft, a portion of the nose section skin and frame must be replaced with a radome having the same general configuration as the nose section it replaces. Most satisfactory radome installation will allow widest possible angle of beam radiation, up to 240 degrees (120 degrees to each side of aircraft heading), before configuration of aircraft causes interference.

3-3. INITIAL ADJUSTMENTS AND TESTS.

a. GENERAL.--The antenna is completely adjusted at the factory and should need no further adjustments; however, the following checks should be made before installation.

b. PREINSTALLATION TEST.

Step 1. Manually rotate the antenna on its azimuth axis 360 degrees to determine that no binding exists at any azimuth position.

CAUTION

When manually adjusting reflector attitude in either azimuth or elevation use a smooth motion; do not start or stop reflector motion with a jerk. Disregard of this caution may result in damage to pinion key in azimuth drive or to taper pin or linkage in tilt drive.

Step 2. Manually tilt the antenna's reflector up and down to its extreme tilt positions to determine that no binding exists at any position of tilt within the mechanically restricted tilt limits. Do not force against action of spring-loaded buffers.

c. POST INSTALLATION TEST.--After the antenna has been completely installed and absorption screen material has been applied to all necessary surfaces in the nose section of the aircraft, perform the following tests:

INSTALLATION

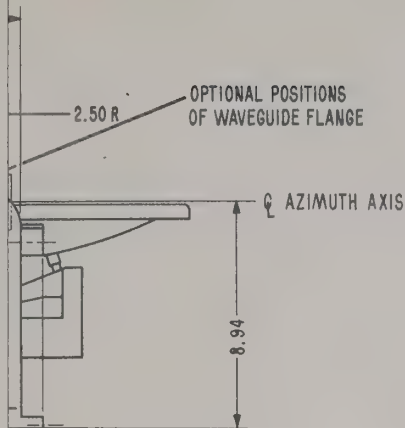
Section III
Paragraph 3-3c

Step 1. Manually rotate antenna 360 degrees at zero tilt angle and at maximum tilt angles above and below the normal zero tilt angle to determine that proper clearance has been provided for every position of the antenna. Observe caution above.

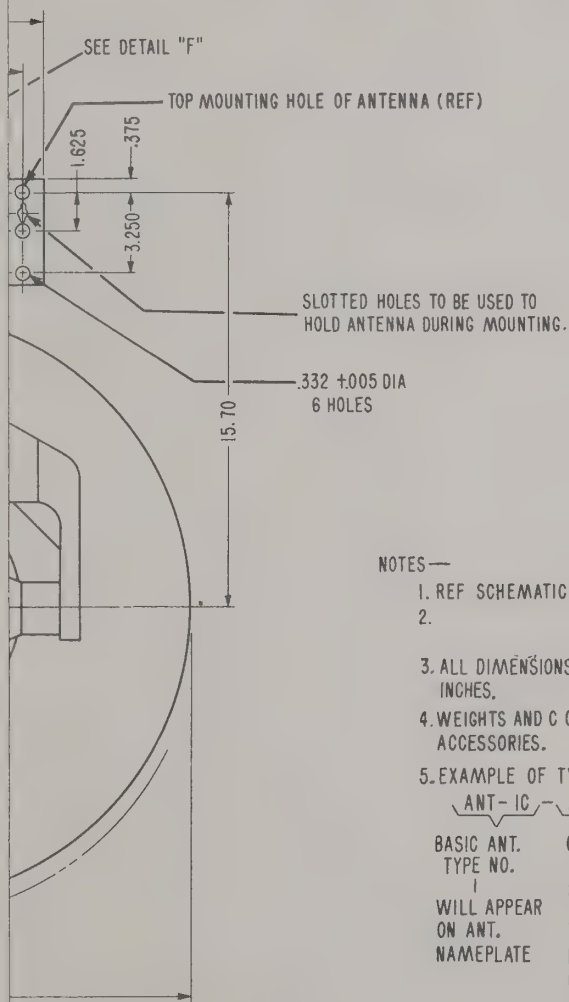
Step 2. Check to see that all electrical connections to the antenna are secure.

NOTE

Do not install radome until after complete system has been installed and operationally checked out as per instructions in system instruction book.

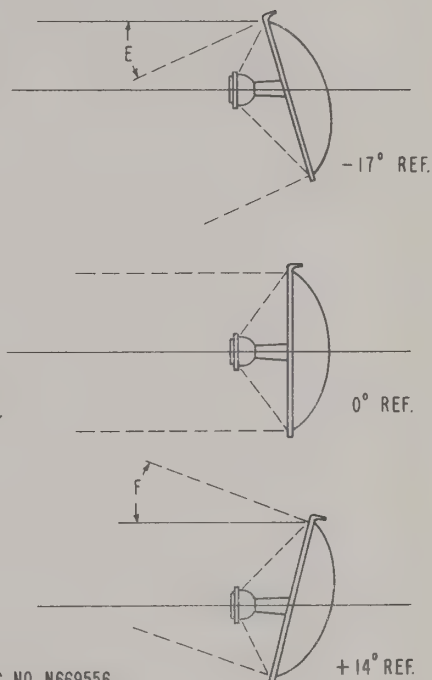


ING PLUG AN3106E-36-7S
T) OR AN3108-36-7S (90°)



RAY DIAGRAMS

ANGLES SHOWN BELOW ARE FOR
MAXIMUM NORMAL SERVO OPERATION.



NOTES—

1. REF SCHEMATIC NO. N669556.
- 2.

3. ALL DIMENSIONS IN
INCHES.

4. WEIGHTS AND C OF G SHOWN DO NOT INCLUDE
ACCESSORIES.

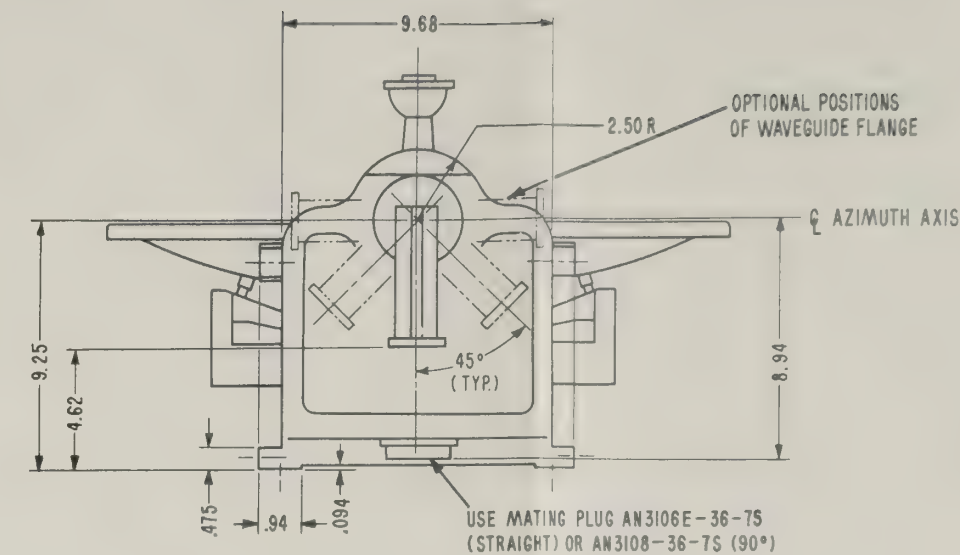
5. EXAMPLE OF TYPE NO.

ANT-1C-AC

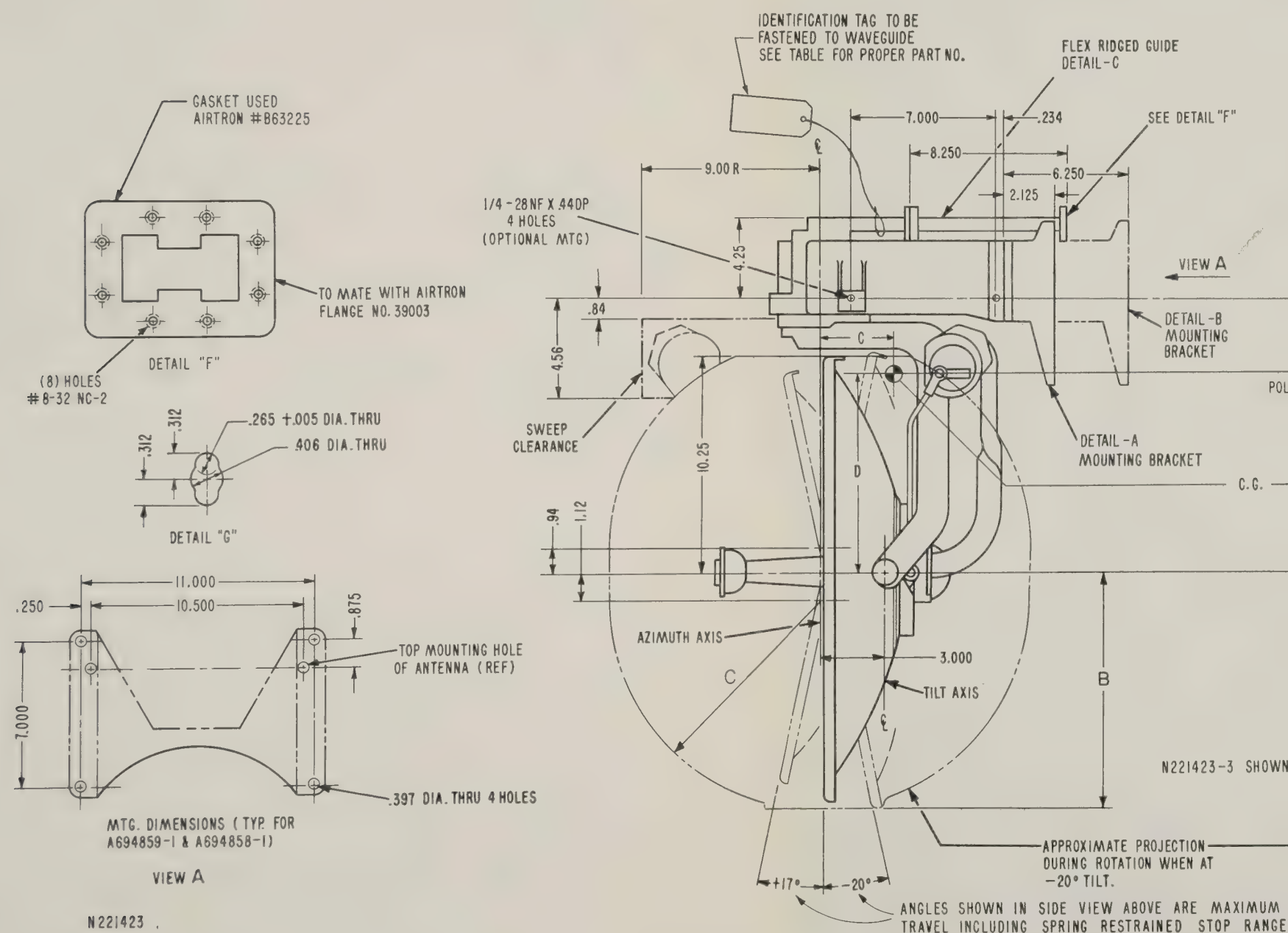
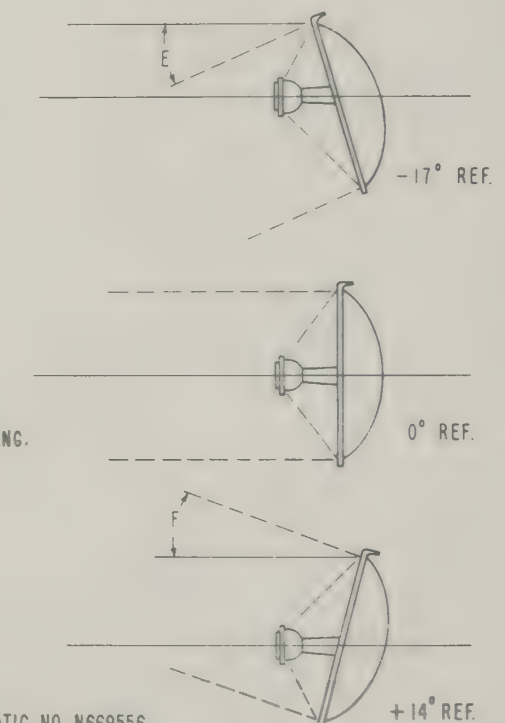
BASIC ANT. TYPE NO. WILL APPEAR ON ANT. NAMEPLATE	OPTIONAL ACCESSORIES IF ANY SEE COLUMNS 7,8,9 THESE APPEAR ON IDENT TAG COLUMN 10
--	---

-1C(), 1D() Antenna, Part of RDR-1 (C-band) Airborne
Radar System, Dimensional Outline Drawing

BENDIX RADIO PART NUMBER	TYPE NO. (SEE NOTE 5)	PARABOLIC REFLECTOR DIA	DIM "A"	DIM "B"	WEIGHT (SEE NOTE 4)	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	C. OF G.		RAY ANGLES			DIM. "C"
						DETAIL "A" MTG. BRACKET	DETAIL "B" MTG. BRACKET	DETAIL "C" FLEXGUIDE	TAG PART NO.	C	D	E	0°	F	
N221423-1	ANT-1C	22" DIA.	22.125	11.38	25	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NONE	3.60	9.72	28.4°	0°	23.4°	11.06
N221423-2	ANT-1C-A	22" DIA.	22.125	11.38	25	A694858-1	NOT SUPPLIED	NOT SUPPLIED	L2080043-23	3.60	9.72	28.4°	0°	23.4°	11.06
N221423-3	ANT-1C-AC	22" DIA.	22.125	11.38	25	A694858-1	NOT SUPPLIED	A680047-1	L2080043-24	3.60	9.72	28.4°	0°	23.4°	11.06
N221423-4															
N221423-5	ANT-1D	30" DIA.	30.375	15.84	27	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NONE	3.51	8.55	30.6°	0°	25.2°	15.18
N221423-6	ANT-1D-B	30" DIA.	30.375	15.84	27	NOT SUPPLIED	A694859-1	NOT SUPPLIED	L2080043-27	3.51	8.55	30.6°	0°	25.2°	15.18
N221423-7	ANT-1D-BC	30" DIA.	30.375	15.84	27	NOT SUPPLIED	A694859-1	A680047-1	L2080043-28	3.51	8.55	30.6°	0°	25.2°	15.18

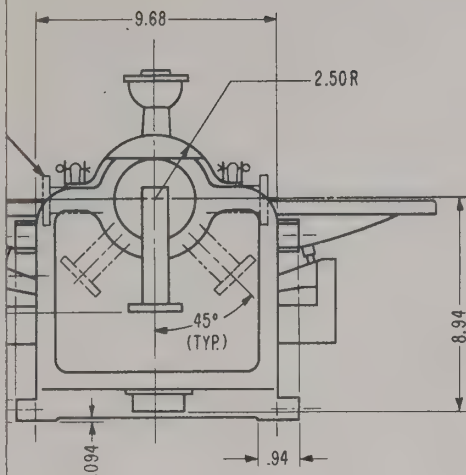


RAY DIAGRAMS
ANGLES SHOWN BELOW ARE FOR
MAXIMUM NORMAL SERVO OPERATION.



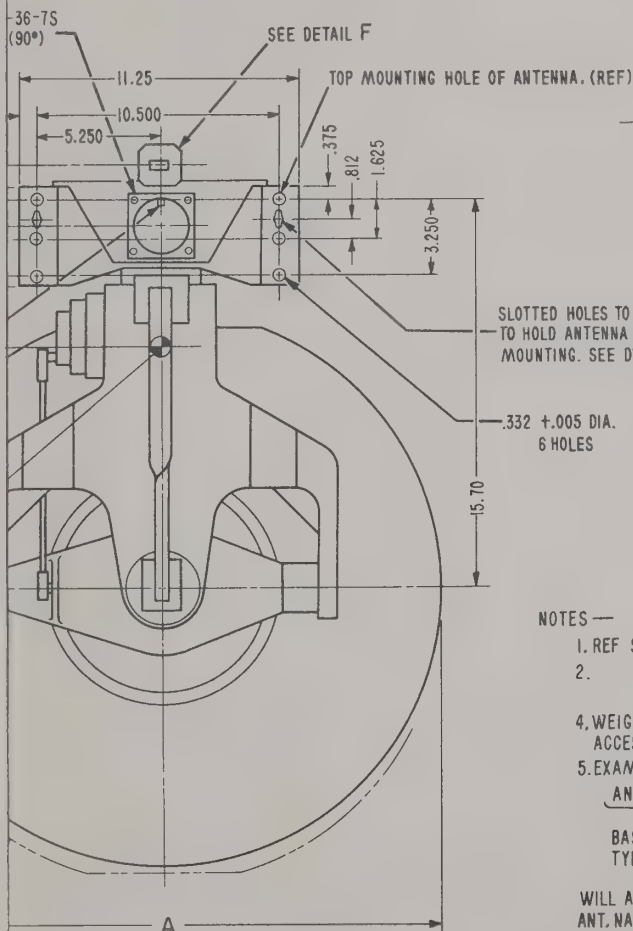
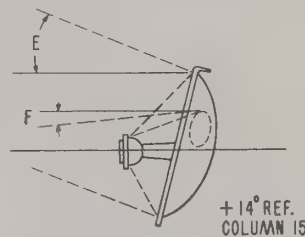
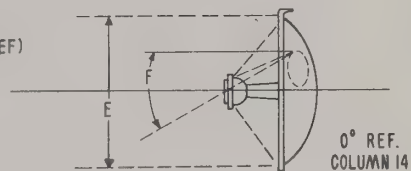
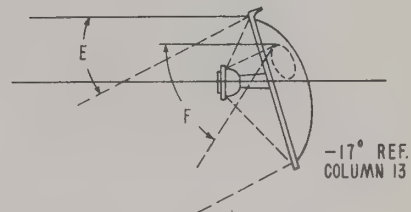
- NOTES—
1. REF SCHEMATIC NO. N669556.
 - 2.
 3. ALL DIMENSIONS IN INCHES.
 4. WEIGHTS AND C OF G SHOWN DO NOT INCLUDE ACCESSORIES.
 5. EXAMPLE OF TYPE NO.
ANT-1C-AC
BASIC ANT. TYPE NO. IF ANY
WILL APPEAR ON ANT. NAMEPLATE SEE COLUMNS 7,8,9
THESE APPEAR ON IDENT TAG COLUMN 10

Figure 3-2. ANT-1C(), 1D() Antenna, Part of RDR-1 (C-band) Airborne Radar System, Dimensional Outline Drawing



RAY DIAGRAMS

ANGLES SHOWN BELOW ARE FOR
MAXIMUM NORMAL SERVO OPERATION.



SLOTTED HOLES TO BE USED
TO HOLD ANTENNA DURING
MOUNTING. SEE DETAIL E

.332 ±.005 DIA.
6 HOLES

NOTES —

1. REF SCHEMATIC NO. N669556.
- 2.

4. WEIGHTS AND C OF G SHOWN DO NOT INCLUDE
ACCESSORIES.

5. EXAMPLE OF TYPE NO.

ANT-1B-ABC

BASIC ANT.
TYPE NO.

WILL APPEAR ON
ANT. NAMEPLATE.

OPTIONAL ACCESSORIES
IF ANY
SEE COLUMNS 7, 8, 9 & 10

THESE APPEAR ON IDENT.
TAG. COLUMN 11.

6. ALL DIMENSIONS IN INCHES.

-1A-1(), -1B(), -1E() Antenna, Part of RDR-1 (X-band)
Airborne Radar System, Dimensional Outline Drawing

BENDIX RADIO PART NUMBER	(SEE NOTE 5) TYPE NO.	PARABOLIC REFLECTOR DIA.	DIM. A	DIM. B	NOTE 4 WEIGHT	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	DIM. C	COLUMN 12		COLUMN 13		COLUMN 14		COLUMN 15	
						DETAIL A MTG. BRACKET	DETAIL B TRANSITION	DETAIL C FLEXGUIDE	DETAIL D MTG. BRACKET	TAG PART NO.		C OF G		-17° REF.		0° REF.		+14° REF.	
												C	D	E	F	E	F	E	F
N224462-2	ANT-1A-1	22" DIA.	22 1/8	11.38	23 3/4	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NONE	11.06								
N224462-3	ANT-1A-1-A	22" DIA.	22 1/8	11.38	23 3/4	A694858-1	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	L2080043-3	11.06								
N224462-4	ANT-1A-1-AB	22" DIA.	22 1/8	11.38	23 3/4	A694858-1	A680046-1	A680047-1	NOT SUPPLIED	L2080043-4	11.06								
N224462-5	ANT-1A-1-ABC	22" DIA.	22 1/8	11.38	23 3/4	A694858-1	A680046-1	NOT SUPPLIED	NOT SUPPLIED	L2080043-5	11.06								
N224462-6	ANT-1A-1-B	22" DIA.	22 1/8	11.38	23 3/4	NOT SUPPLIED	A680046-1	NOT SUPPLIED	NOT SUPPLIED	L2080043-6	11.06								
N224462-7	ANT-1B	22" DIA.	22 1/8	11.38	25	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NONE	11.06	3.86	9.68	28.4°	56.9°	0°	28.5°	23.4°	5.1°
N224462-8	ANT-1B-A	22" DIA.	22 1/8	11.38	25	A694858-1	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	L2080043-8	11.06	3.86	9.68	28.4°	56.9°	0°	28.5°	23.4°	5.1°
N224462-9	ANT-1B-AB	22" DIA.	22 1/8	11.38	25	A694858-1	A680046-1	NOT SUPPLIED	NOT SUPPLIED	L2080043-9	11.06	3.86	9.68	28.4°	56.9°	0°	28.5°	23.4°	5.1°
N224462-10	ANT-1B-ABC	22" DIA.	22 1/8	11.38	25	A694858-1	A680046-1	A680047-1	NOT SUPPLIED	L2080043-10	11.06	3.86	9.68	28.4°	56.9°	0°	28.5°	23.4°	5.1°
N224462-11	ANT-1B-B	22" DIA.	22 1/8	11.38	25	NOT SUPPLIED	A680046-1	NOT SUPPLIED	NOT SUPPLIED	L2080043-11	11.06	3.86	9.68	28.4°	56.9°	0°	28.5°	23.4°	5.1°
N224462-12																			
N224462-13																			
N224462-14																			
N224462-15	ANT-1E	30" DIA.	30 3/8	15.84	27.5	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	NONE	15.18	3.51	8.55	30.6°	59.1°	0°	28.5°	25.2°	3.3°
N224462-16	ANT-1E-D	30" DIA.	30 3/8	15.84	27.5	NOT SUPPLIED	NOT SUPPLIED	NOT SUPPLIED	A694859-1	L2080043-16	15.18	3.51	8.55	30.6°	59.1°	0°	28.5°	25.2°	3.3°
N224462-17	ANT-1E-BD	30" DIA.	30 3/8	15.84	27.5	NOT SUPPLIED	A680046-1	NOT SUPPLIED	A694859-1	L2080043-17	15.18	3.51	8.55	30.6°	59.1°	0°	28.5°	25.2°	3.3°
N224462-18	ANT-1E-BCD	30" DIA.	30 3/8	15.84	27.5	NOT SUPPLIED	A680046-1	A680047-1	A694859-1	L2080043-18	15.18	3.51	8.55	30.6°	59.1°	0°	28.5°	25.2°	3.3°
N224462-19	ANT-1E-B	30" DIA.	30 3/8	15.84	27.5	NOT SUPPLIED	A680046-1	NOT SUPPLIED	NOT SUPPLIED	L2080043-19	15.18	3.51	8.55	30.6°	59.1°	0°	28.5°	25.2°	3.3°

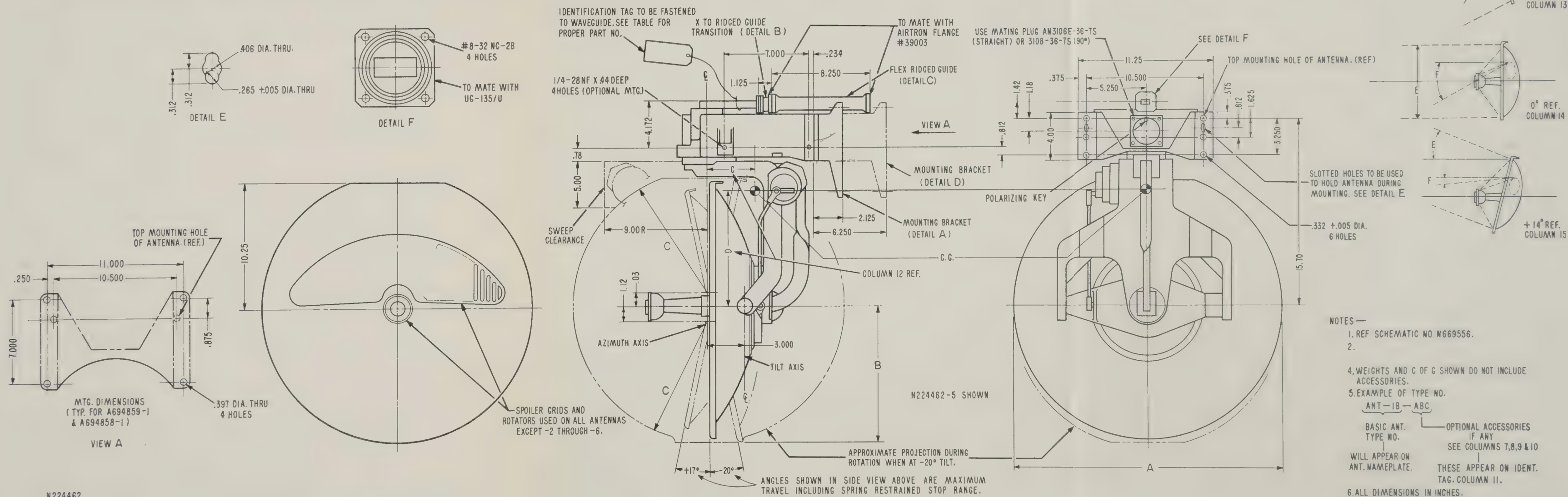


Figure 3-3. ANT-1A-1(), -1B(), -1E() Antenna, Part of RDR-1 (X-band) Airborne Radar System, Dimensional Outline Drawing

SECTION IV OPERATION

4-1. GENERAL.

The ANT-1() Antenna is remotely operated from a type CON-1() Control which is installed in the aircraft at a position convenient to the pilot and co-pilot.

Section IV of the system instruction book contains full operating instructions for all units of the radar system. However, the following information should be noted in connection with antenna stabilization.

Correct roll and pitch stabilization of the ANT-1() radar antenna is attained only when the external vertical reference gyro is fully erect. Should the gyro precess, due to centrifugal force acting on the gyro leveling device, the radar antenna will not be properly stabilized.

An aircraft in a turn, coordinated or not, will result in centrifugal action on the vertical gyro leveling device and the gyro will re-erect to a dynamic vertical. The Sperry A-12 autopilot system overcomes this problem by disabling the roll erection of the vertical gyro when the aircraft is in a turn. With the Sperry A-12 autopilot system engaged, the roll erection is disabled whenever the pedestal mounted "turn" knob is out of the detent position. If the autopilot is disengaged, however, the roll erection will not be disabled during an aircraft turn, and the vertical gyro may precess. This will result in improper radar antenna stabilization until the vertical gyro returns to a true vertical.

Sperry indicates that "The maximum possible precession during a standard rate 180° turn would be 3° to 5°, however, in actual practice it is felt that the maximum error is not attained."

This problem may arise whenever the autopilot is disengaged or an independent vertical reference gyro quick erection system is employed for antenna stabilization.

Section IV
Paragraph 4-1

OPERATION

The Sperry A-12-1 Gyro will eliminate this turn precession by incorporating a roll erection cut-out device for bank angles in excess of 6° .

SECTION V

PREVENTIVE MAINTENANCE

5-1. GENERAL.

A schedule of periodic inspections is recommended in the maintenance of the ANT-1() Antenna. Inspections and tests should include frequent operational tests, occasional maintenance inspection and lubrication of the equipment, and an inspection for overhaul after 1000 hours of operation.

A schedule of maintenance test procedures is contained in section V of the system instruction book and it is recommended that those procedures be followed.

Preventive maintenance procedures must include periodic relubrication of specific antenna parts with specific lubricants as outlined in section VI of this handbook, paragraph 6-6.

SECTION VI

CORRECTIVE MAINTENANCE

6-1. GENERAL.

This section contains information essential to the maintenance and overhaul of the ANT-1() Antenna. Included is a list of test equipment required, synchro test and alignment procedures, a performance check list, lubrication data, and procedures for disassembly and reassembly.

If any unusual or special service problems arise, it is suggested that the Service Department, Bendix Radio, Division of Bendix Aviation Corporation, Towson 4, Maryland, be contacted for advice or assistance.

Should it be necessary to ship units to the factory or between operating points, a substantial case made of plywood or equivalently strong material, with braces and felt padding, should be provided.

No equipments should be returned to the factory until a return authorization (RA) form is requested and received from the Service Department of Bendix Radio.

6-2. FIELD SERVICE LIMITATIONS.

a. GENERAL.--Certain features of the ANT-1() Antenna are not readily adaptable to field servicing without full and complete facilities for microwave beam pattern measurements, VSWR measurements, and r-f power measurements. Field adjustment of the antenna's r-f functions is not recommended except as outlined in paragraphs 6-2b, c, d, and e following.

b. ANTENNA FEED SECTIONS.--Each antenna is equipped with a feed section (5, figure 9-1) designed for the operating frequency of the antenna (X- or C-band) and is adjusted to the focal length of the parabolic reflector used. Table A, figure 9-10, sheet 3 of 3 lists the part number of the proper feed section to use with each antenna

type. Feed sections of different part numbers are not interchangeable; if a replacement must be made, make certain to order the proper feed section for the antenna type under repair.

Feed sections for X-band antenna types ANT-1B() and ANT-1E() are equipped with gyrators (beam rotators) consisting of a ferrite core surrounded by a magnetizing coil as shown in figure 2-2.

Feed sections for C-band antenna types ANT-1C() and ANT-1D() do not contain the gyrator feature.

Field service repair of antenna feed sections is not recommended.

c. REFLECTORS AND SPOILER GRIDS. --The two standard sizes of parabolic reflectors (22-inch and 30-inch diameter) are both truncated to fit a standard reflector mount used on all ANT-1() Antennas. Each size reflector requires a feed section to match the reflector focal length as stated in paragraph 6-2b above.

Each reflector is carefully adjusted for optimum beam characteristics when originally installed in its mount. Removal of the reflector from its mount is not recommended. If the reflector must be removed, note all attaching hardware, spacers, and shims and make certain that all parts are replaced in their original positions to assure, as nearly as possible, that the reflector is reinstalled with the same relative orientation it had originally.

X-band antenna types ANT-1B() and ANT-1E() are equipped with spoiler (beam shaping) grids to provide a csc^2 beam pattern for ground mapping operations. The positioning and spacing of the spoiler grid on the reflector is critical and must not be disturbed.

Field repair of a damaged reflector or spoiler grid is not recommended. While a complete replacement of reflector and spoiler grid is practical, the optimum beam characteristics can be assured only by adjustments of the reflector and spoiler grid on an antenna range.

d. ROTARY JOINT.

(1) GENERAL. --The rotary joint (2, figure 2-1) is composed of two matched sections which are not replaceable separately. Field service repair of rotary joints is not recommended, except as follows.

(2) INSPECTION AND LUBRICATION. --Use the following procedure whenever the rotary joint is to be inspected.

Step 1. Disconnect waveguide (transmission line) from the input flange (1, figure 9-3) of the rotary joint.

Step 2. Inspect circular rubber pressure gasket (1, figure 2-1). This item is a part of X-band rotary joints only. Replace gasket, during reassembly, if it is flat, damaged, or non-resilient.

Step 3. Remove the four Allen-head screws which secure the rotary joint input section (1-2-3, figure 2-1) to the antenna mounting base casting.

Step 4. Carefully pull out the waveguide input section of the rotary joint. Care must be exercised to prevent distortion of the center conductor (17, figure 9-5). A back-and-forth rotary motion applied to the section being extracted will facilitate removal.

CAUTION

Several copper "0" shims are used between the rotary joint section (20, figure 9-5) and the antenna mounting base casting. These shims fix the dimension between rotary joint mounting bosses at 4.281 ± 0.001 inches. Make sure the shims are not lost or damaged. The same shims, or equivalent replacements, must be used when reassembling or replacing the rotary joint.

Step 5. Ascertain that the pressure seal gasket (neoprene "0" ring) has not deteriorated. This gasket is located in a slot near the top of the inside wall of the outer conductor (1, figure 9-5) of the rotary joint.

Step 6. Lightly relubricate the pressure seal gasket, located in step 5, with DC-55 silicone grease; this should be done each time the rotary joint is separated.

Step 7. Check the tip of the center conductor (17, figure 9-5); if it has a brown glass sleeve, 3/16-inch long, do not lubricate. This glass sleeve rides in a teflon bearing surface. If the tip of the center conductor is plated brass and is undercut from the main shaft, lightly lubricate the first 1/8 inch of the tip with DC-55 silicone grease.

Step 8. Carefully reassemble the rotary joint making sure to replace the copper "0" shims to maintain the 4.281 ± 0.001 -inch spacing mentioned in the caution notice above.

NOTE

If rotary joint replacement is necessary, both sections (same numerical serial numbers) must be removed and replaced. In all cases both sections of the rotary joint must bear the same serial number.

CAUTION

Whenever the entire rotary joint is replaced, position the rotating section (6-7-8, figure 2-1) in the antenna mounting base casting without tightening the rotary joint mounting screws. Tightly connect the rotary joint flange (8) to the rigid axial twist section of the waveguide (10); then tighten the rotary joint mounting screw. The above procedure should prevent stresses on the waveguide r-f system due to possible misalignment. If the antenna is equipped with a flexible elbow and rigid axial twist section assembly, as in paragraph 6-2e below, the above procedure need not be followed since the flexible elbow

section of the waveguide assembly compensates for whatever small misalignment may exist.

e. WAVEGUIDE SECTIONS. --This paragraph refers to the axial twist section of rigid waveguide (4, figure 9-3), and to a newer waveguide assembly consisting of a flexible elbow section and a rigid twist section as shown in figure 9-10, page 1 of 3.

If the newer waveguide assembly of flexible and rigid sections is already a part of the antenna either section (flexible or rigid) can be replaced independently as required.

Table A of figure 9-10, page 1 of 3, lists the waveguide sections available for both X-band and C-band antennas.

6-3. GENERAL FIELD SERVICE.

a. TEST FACILITIES REQUIRED. --The test facilities and test equipment described in the RDR-1B-1 (X-band) Transmitter-Receiver Instruction Book I. B. 737, and the RDR-1C (C-band) Transmitter-Receiver Instruction Book I. B. 738, include such test equipment and facilities as are required for testing and servicing the ANT-1() Antenna as a system component.

The specific test equipment required for testing and servicing the ANT-1() Antenna only, is listed in table 6-1. Figure 6-1 is a schematic diagram of a test jig designed to facilitate the testing and zeroing of synchros in the antenna.

TABLE 6-1. TEST EQUIPMENT REQUIRED FOR ANT-1() ANTENNAS

A-c VTVM, Ballantine, Type 310
Variac, General Radio, Type V-10-HMT
Volt-Ohmmeter, Triplet, Model 630
ANT-1() test jig (figure 6-1) (optional)
Power supply, 26 volts, 400 cps or 115 volts, 400 cps
Schematic diagram of ANT-1() Antenna (figure 9-7)

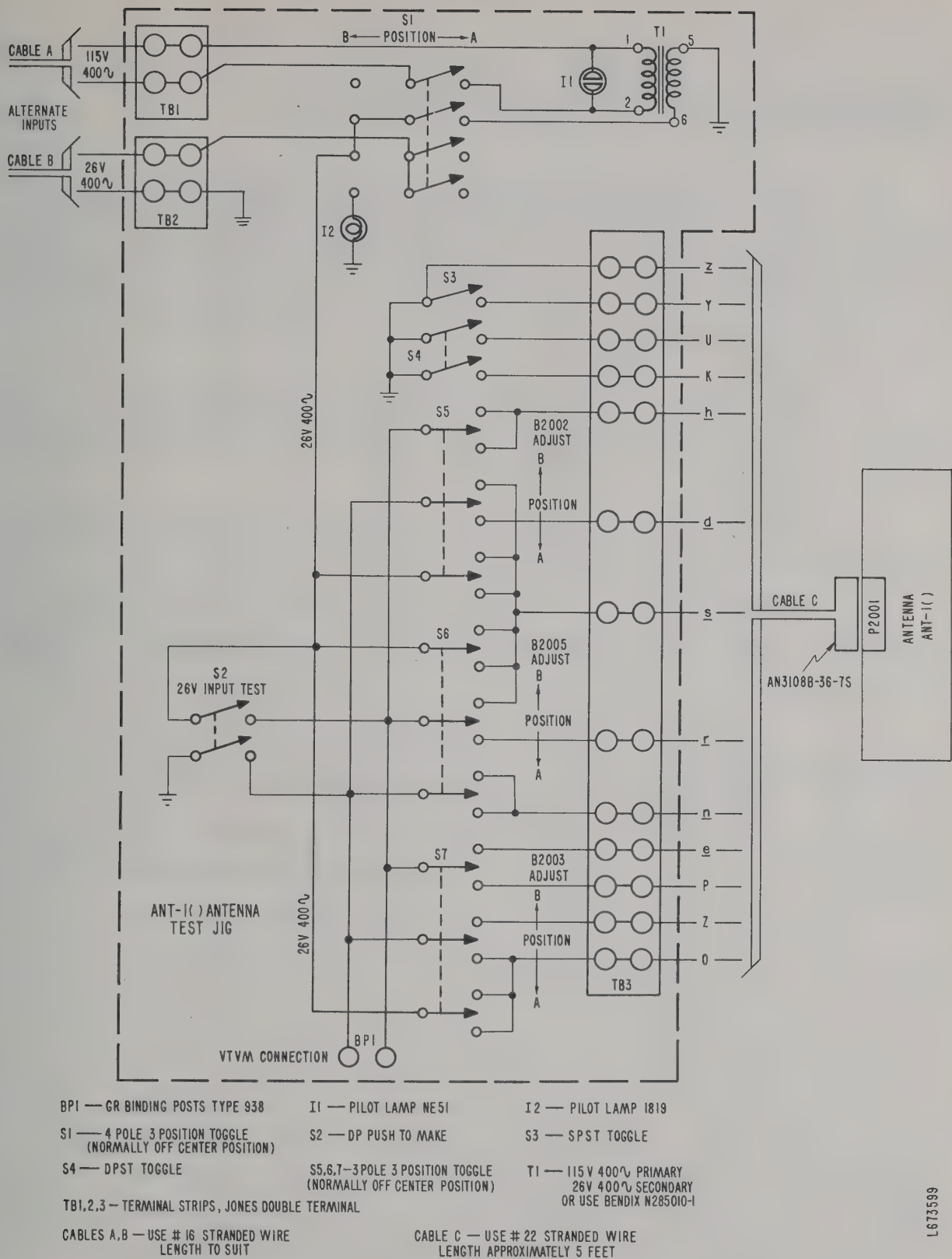


Figure 6-1. ANT-1() Antenna Test Jig, Schematic Diagram

b. ANT-1() TEST JIG.--The ANT-1() test jig, shown schematically in figure 6-1, utilizes a series of switches to selectively establish various circuits through the two synchros and one resolver in the antenna, to facilitate zeroing the synchros and resolver. The test jig is designed to operate on a primary input of 115 volts, 400 cps or 26 volts, 400 cps.

If the test jig is desired it must be built by the using organization; however, its use is optional. Two procedures are given for zeroing each synchro and resolver; one requires the test jig, the other does not.

Test jig operation information is included, as required, with the zeroing procedures for the synchros and resolvers.

c. CONTINUITY TESTS.--With the ANT-1() Antenna completely disconnected from the radar system and from the test jig make the continuity tests listed in table 6-2.

TABLE 6-2. ANT-1() CONTINUITY TESTS

Conditions: Azimuth drive motor switch S2001 closed. Tilt drive motor switch S2002 closed.				
FROM CONNECTOR	PIN	TO CONNECTOR	PIN	READ ON OHMMETER
P2001	X	P2001	x	45 ohms
	u		z	Short
	u	Ground		Short
	u		j	Short
	d		h	11 ohms
	d		Y	11 ohms
	*S	Ground		*600 ohms
	s	Ground		21 ohms
	n	Ground		11 ohms
	n		r	11 ohms
	O		U	360 ohms

TABLE 6-2. ANT-1() CONTINUITY TESTS (Continued)

FROM CONNECTOR	PIN	TO CONNECTOR	PIN	READ ON OHMMETER
	K		P	160 ohms
	Z		e	160 ohms
	V	Ground	2	29 ohms
	G		x	54 ohms
TB2005**	1	TB2005**	2	360 ohms
	1		3	600 ohms
	2		3	240 ohms
*Ohmmeter should show open circuit on types ANT-1C() and ANT-1D() antennas.				
**On X-band antennas only				

6-4. ALIGNMENT OF AZIMUTH AND ELEVATION ZERO-DEGREE INDEX MARKS.

a. GENERAL.--The azimuth and elevation angle of the radiated beam depends on the instantaneous position of the antenna reflector and feed assembly. Every azimuth position of the radiated beam is referenced to the heading of the aircraft which is indicated as zero degree in azimuth.

Each antenna is equipped with a set of index marks (1 and 2, figure 9-4) to indicate the zero degree azimuth position of the reflector and feed assembly. One index mark is scribed on the front of the antenna frame (2) perpendicular to the center axis of the feed section (4). This scribed index mark rotates with the frame and reflector assembly. The second index mark (1) is scribed on an adjustable bracket which is attached with two screws to the antenna mounting base assembly. When the two azimuth index marks coincide the antenna must be looking dead ahead (zero degree azimuth). The adjustable index mark (1) has been accurately set at the factory and this adjustment should not be disturbed. If for any reason this adjustment is disturbed it can be checked and reset mechanically by following the procedure outlined in paragraph 6-4b.

The elevation angle of the radiated beam is referenced to the center axis of the feed section (5, figure 9-1). When the reflector (4, figure 9-1) is positioned at zero degree tilt the beam is radiated in line with the center axis of the feed section.

Each antenna is equipped with a set of index marks (6, figure 9-1) to indicate the tilt angle of the radiated beam. One of the index marks is scribed on a plate (item 135, figure 9-10, sheet 2 of 3) which is attached to the antenna frame and is fixed in position. A pointer (item 152) is scribed with a zero-degree mark and marks at ± 5 , ± 10 , and ± 15 degrees. This pointer is attached to and follows the movement of the segment gear (item 151) which pivots on the antenna tilt axis.

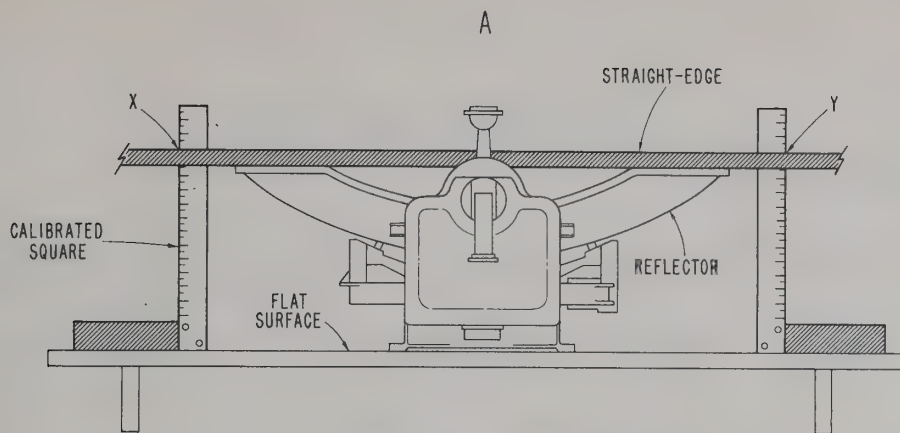
When the zero-degree index mark on the pointer coincides with the index mark on the fixed plate the reflector is at zero-degree tilt. The pointer (item 152) is adjustable and has been accurately set at the factory and this adjustment should not be disturbed. If for any reason this adjustment is disturbed it can be checked and re-set mechanically by following the procedures outlined in paragraph 6-4c.

Figure 6-2 shows the mechanical setup required to test and adjust the azimuth and elevation zero-degree index marks. Diagram A of figure 6-2 shows the antenna firmly mounted on a flat horizontal surface, reflector looking up, with a straightedge supported at two points on the reflector rim. Diagram B shows the correct position of the straightedge on the reflector for test and adjustment of the azimuth zero-degree index mark. Diagram C shows the correct position of the straightedge on the reflector for test and adjustment of the tilt zero-degree index mark.

Two calibrated squares are placed on the flat mounting surface with their edges positioned to contact points X and Y of the straightedge as shown in diagram A. A screwdriver is the only other tool required for the adjustments.

NOTE

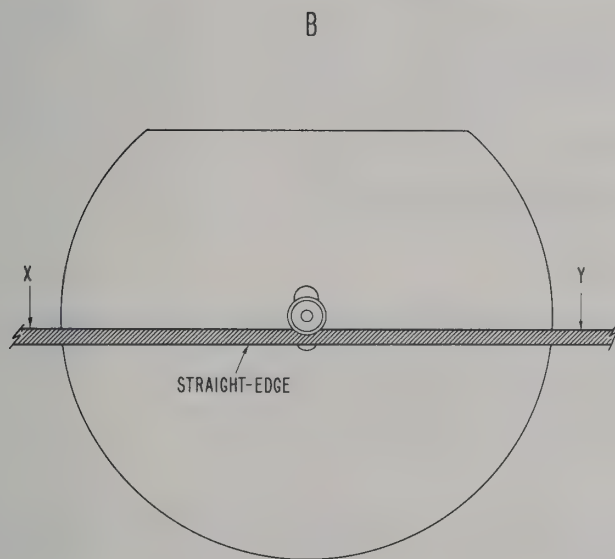
Do not attempt the following adjustments unless the reflector on the antenna being serviced is properly mounted and undistorted. Bent, distorted, or otherwise damaged reflectors should be replaced.



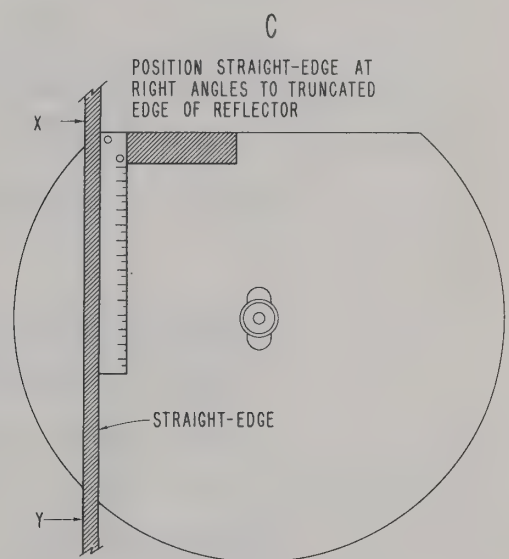
SETUP FOR CALIBRATING AZIMUTH AND
ELEVATION ZERO DEGREE INDEX POINTERS

NOTE:

X AND Y REPRESENT POINTS ON STRAIGHT-EDGE
WHICH ARE THE SAME DISTANCE FROM THE
EDGE OF REFLECTOR RIM. REFLECTOR IS AT
ZERO DEGREE WHEN CALIBRATED SQUARE
MEASUREMENTS AT POINTS X AND Y ARE
EQUAL.



POSITION OF STRAIGHT-EDGE ON
REFLECTOR FOR AZIMUTH CALIBRATION



POSITION OF STRAIGHT-EDGE ON
REFLECTOR FOR ELEVATION CALIBRATION

N677337

Figure 6-2. Setup Data for Alignment of Azimuth and Elevation Zero-
Degree Index Marks

b. AZIMUTH ZERO-DEGREE INDEX MARK ALIGNMENT PROCEDURE.

Step 1. Make test setup as shown in diagrams A and B of figure 6-2.

Step 2. Manually adjust azimuth position of reflector hanger assembly until points X and Y on straightedge give equal readings on the two calibrated squares. The straightedge will then be parallel to the flat mounting surface and to the rear mounting bracket surface of the antenna base. The position of the reflector so established is the correct mechanical azimuth zero-degree position.

Step 3. Secure the reflector in the exact position established in step 2.

Step 4. Check the azimuth zero-degree index marks (1 and 2, figure 9-4). If they do not coincide proceed with step 5. If the index marks do coincide no further action is necessary.

Step 5. Loosen the two screws fastening the adjustable index mark bracket (1, figure 9-4) and adjust so that the two index marks (1 and 2) coincide, then tighten screws to secure bracket (1) in adjusted position.

Step 6. Recheck adjustment starting with step 2.

NOTE

If the azimuth zero-degree index mark has been readjusted the azimuth synchro generator B2002 and the azimuth resolver B2003 must be re-zeroed as outlined in paragraph 6-5.

c. ELEVATION ZERO-DEGREE INDEX MARK ALIGNMENT PROCEDURE.

Step 1. Make test setup as shown in diagrams A and C of figure 6-2.

Step 2. Secure reflector in azimuth zero-degree position.

Step 3. Manually adjust tilt position of reflector only until points X and Y on straightedge give equal readings on the two calibrated squares. The straightedge will then be parallel to the flat mounting surface and to the rear mounting bracket

surface of the antenna base. The position of the reflector so established is the correct mechanical zero-degree tilt position.

Step 4. Secure the reflector in the exact position established in step 3.

Step 5. Check the zero-degree tilt index marks (6, figure 9-1). If they do not coincide proceed with step 6. If the zero-degree index mark on the pointer coincides with the mark on the fixed plate no further action is necessary.

Step 6. Remove the windowed panel covering the tilt index mark assembly (6, figure 9-1).

Step 7. Loosen screw securing calibrated pointer (item 152, figure 9-10, sheet 2 of 3) to segment gear (item 151).

Step 8. Carefully adjust pointer so that zero-degree index mark on pointer coincides with index mark on fixed plate (item 135).

Step 9. Secure pointer in exact position established in step 8 by tightening pointer mounting screw (item 153).

Step 10. Recheck adjustment starting with step 3.

NOTE

If the tilt zero-degree index mark has been readjusted the tilt control transmitter synchro B2005 must be re-zeroed as outlined in paragraph 6-5.

6-5. SYNCHRO AND RESOLVER ZEROING PROCEDURES.

a. GENERAL. --The ANT-1() Antenna contains an azimuth synchro generator B2002 (15, figure 9-5), a tilt control transmitter synchro B2005 (6, figure 9-3), and an azimuth resolver B2003 (5, figure 9-5). Alignment (zeroing) of these three units is essential to the satisfactory operation of a radar set. The units have been properly zeroed at the factory and will require re-zeroing after any of the following changes:

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Paragraphs 6-5a to 6-5b

CORRECTIVE MAINTENANCE

1. Azimuth zero-degree index mark (1, figure 9-4) has been readjusted.
(Affects B2002, B2003.)
2. Tilt zero-degree index mark (6, figure 9-1) has been readjusted.
(Affects B2005.)
3. Any servicing operation which disturbs the original alignment of
B2002, B2003, or B2005.

Zeroing procedures are made relatively simple with the test jig (figure 6-1) described in paragraph 6-3b and the procedures outlined in paragraphs 6-5b, c, and d.

Zeroing can also be accomplished without the test jig by the procedures outlined in paragraphs 6-5e, f, and g; however, more time and labor will be involved.

Zeroing is essentially a test bench operation in which the antenna is mounted conveniently for the operator and in such a position that the reflector can be fixed in both azimuth and tilt attitudes.

Since the azimuth synchro generator B2002 and the azimuth resolver B2003 are in the antenna base, the base cover must be removed to expose them for servicing. The tilt control transmitter synchro B2005 is inclosed by a cover (6, figure 9-3) which must be removed for servicing.

b. AZIMUTH SYNCHRO GENERATOR B2002 ZEROING PROCEDURE (TEST JIG METHOD).

Step 1. Connect test jig to antenna by mating the plug on cable C of test jig with connector P2001 (11, figure 9-5) on antenna.

Step 2. Set all test jig switches at off (neutral) positions.

Step 3. Connect an ac vtvm to test jig binding post terminals "BP1".

Step 4. Connect test jig to a primary source of either 115 volts, 400 cps (through test jig cable A), or to 26 volts, 400 cps (through test jig cable B).

NOTE

If primary supply is 115 volts place test jig switch S1 in position A; indicator lamp I1 must light. If primary supply is 26 volts place test jig switch S1 in position B; indicator lamp I2 must light. A variac placed in series with the primary supply leads (cable A or B) can be used to adjust voltage to exactly 26 volts as indicated on vtvm. Press momentary switch S2 on test jig to connect vtvm for this adjustment.

Step 5. Set reflector dead ahead (zero degree in azimuth) so that the azimuth zero-degree index marks (1 and 2, figure 9-4) coincide. Secure reflector in this position.

Step 6. Loosen the three slotted screws (item 217, figure 9-10, sheet 3 of 3) locking the azimuth synchro generator B2002 case.

Step 7. Close test jig switch S3.

Step 8. Place test jig switch S5 in position A.

CAUTION

Allow switch S5 to remain in position A only long enough to make adjustment indicated in step 9.

Step 9. Manually rotate the azimuth synchro generator case (15, figure 9-5) to obtain a zero reading on vtvm. Make certain the reflector is still secured in the zero-degree azimuth position as established in step 5.

Step 10. Place test jig switch S5 in position B.

CAUTION

Allow switch S5 to remain in position B only long enough to make adjustment indicated in steps 11 and 12.

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Paragraphs 6-5b to 6-5c

CORRECTIVE MAINTENANCE

Step 11. If meter reads about 15 volts ac perform step 13 next. If meter reads about 36 volts ac perform step 12 next.

Step 12. Repeat steps 8 and 9 rotating the case of synchro B2002 180 degrees through a maximum reading to a second null. Repeat steps 10 and 11.

Step 13. Open test jig switch S3.

Step 14. Repeat steps 8 and 9 using lowest voltmeter scale.

Step 15. Place test jig switch S5 in the center (neutral) position.

Step 16. Secure synchro B2002 by tightening the three case locking screws.

Step 17. Recheck for zero ac as in steps 7, 8, and 9.

Step 18. Place all test jig switches in off (neutral) positions.

c. AZIMUTH RESOLVER B2003 ZEROING PROCEDURE (TEST JIG METHOD).

Step 1. Connect test jig, antenna, primary power, and vtm as in steps 1, 2, 3, and 4 of paragraph 6-5b.

Step 2. Loosen the three slotted screws (item 221, figure 6-10, sheet 3 of 3) locking the azimuth resolver B2003 case.

Step 3. Close test jig switch S4.

Step 4. Place test jig switch S7 in position A.

CAUTION

Allow switch S7 to remain in position A only long enough to make adjustment indicated in step 5.

Step 5. Rotate azimuth resolver B2003 case for a maximum vtm reading, about 45 volts ac.

Step 6. Place test jig switch S7 in position B.

CORRECTIVE MAINTENANCE

Section VI
Paragraphs 6-5c to 6-5d

CAUTION

Allow switch S7 to remain in position B only long enough to make adjustment as indicated in step 7.

Step 7. Rotate case of B2003 for a zero reading on vtvm using lowest voltmeter scale.

Step 8. Place test jig switch S7 in center (neutral) position.

Step 9. Secure B2003 by tightening the three case locking screws.

Step 10. Recheck for zero a-c reading as established in steps 6 and 7.

Step 11. Return all test jig switches to off (neutral) positions.

d. TILT CONTROL TRANSMITTER SYNCHRO B2005 ZEROING PROCEDURE (TEST JIG METHOD).

Step 1. Connect test jig, antenna, primary power, and vtvm as in steps 1, 2, 3, and 4 of paragraph 6-5b.

Step 2. Remove cover from synchro B2005 (6 figure 9-3).

Step 3. Loosen the three slotted screws (item 170, figure 9-10, sheet 2 of 3) locking the synchro B2005 case.

Step 4. Set the reflector at zero-degree tilt angle by manually tilting reflector to align the tilt zero-degree index marks (6, figure 9-1). Secure reflector in this position.

Step 5. Place test jig switch S6 in position A.

CAUTION

Allow test jig switch S6 to remain in position A only long enough to make adjustment indicated in step 6.

Step 6. Rotate the case of synchro B2005 to obtain a zero reading on vtvm. Make certain reflector is still positioned at zero-degree tilt as in step 4.

Step 7. Place test jig switch S6 in position B.

CAUTION

Allow test jig switch S6 to remain in position B only long enough to make adjustment indicated in step 8 or 15.

NOTE

If antenna is wired for normal mounting (base above reflector) perform steps 8 through 14 only. If antenna is wired for inverted mounting (reflector above base) perform step 15 next.

Step 8. If meter reads about 36 volts ac perform step 10 next. If meter reads about 15 volts ac perform step 9 next.

Step 9. Rotate case of synchro B2005 180 degrees through maximum meter reading to second null and repeat steps 5 and 6. Recheck steps 7 and 8.

Step 10. Repeat steps 5 and 6 using lowest voltmeter scale.

Step 11. Place test jig switch S6 in center (neutral) position.

Step 12. Secure synchro B2005 by tightening the three case locking screws.

Step 13. Recheck for zero meter reading as in steps 5 and 6.

Step 14. Place all test jig switches in off (neutral) positions. Disconnect test jig from antenna.

Step 15. If meter reads about 15 volts ac perform step 17 next. If meter reads about 36 volts perform step 16 next.

Step 16. Rotate case of synchro B2005 180 degrees through maximum meter reading to second null. Recheck step 15.

Step 17. Repeat steps 5 and 6 using lowest voltmeter scale.

Step 18. Place test jig switch S6 to center (neutral) position.

CORRECTIVE MAINTENANCE

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Paragraphs 6-5d to 6-5e

Step 19. Secure synchro B2005 by tightening the three case locking screws.

Step 20. Recheck for zero meter reading as in steps 5 and 6.

Step 21. Place all test jig switches in off (neutral) positions. Disconnect test jig from antenna.

e. AZIMUTH SYNCHRO GENERATOR B2002 ZEROING PROCEDURE (ALTERNATE METHOD).

Step 1. Apply 26 volts, 400 cps grounded lead to terminal 8 of terminal board TB2001 (13 figure 9-5).

Step 2. Ground terminal 7 of terminal board TB2001 (black stator lead from synchro B2002).

Step 3. Loosen the three slotted screws (item 221, figure 9-10, sheet 3 of 3) securing the synchro case.

Step 4. Set reflector dead ahead (zero degree in azimuth) by aligning the azimuth zero-degree index marks (1 and 2, figure 9-4). Secure reflector in this position.

Step 5. Connect a-c vtm between blue and yellow leads from synchro B2002, terminals 5 and 6 of terminal board TB2001.

Step 6. Apply 26 volts, 400 cps hot lead to red rotor lead from synchro B2002, terminal 10 of terminal board TB2001.

CAUTION

Apply power only long enough to make adjustment indicated below.

Step 7. Rotate case of synchro B2002 for a zero meter reading. Make certain the reflector is still positioned at zero-degree azimuth.

Step 8. Shift vtm lead terminal 5 (blue lead) to terminal 10 (red lead) on terminal board TB2001.

Step 9. Apply 26 volts, 400 cps hot lead to terminal 10 of terminal board TB2001.

CAUTION

Apply power only long enough to make adjustment indicated below.

Step 10. If meter reads about 15 volts ac perform step 12 next. If meter reads about 36 volts ac perform step 11 next.

Step 11. Rotate synchro B2002 180 degrees through a maximum meter reading to a second null and repeat step 7.

Step 12. Remove ground from terminal 7 of terminal board TB2001.

Step 13. Secure synchro B2002 by tightening the three case locking screws.

Step 14. Recheck for zero ac as in steps 5 and 6.

Step 15. Remove a-c power and vtm.

f. AZIMUTH RESOLVER B2003 ZEROING PROCEDURE (ALTERNATE METHOD).

Step 1. Apply 26 volts, 400 cps grounded lead to terminal 8 of terminal board TB2001 (13, figure 9-5).

Step 2. Ground terminals 4 and 6 of terminal board TB2002 (8, figure 9-5).

Step 3. Connect a-c vtm between red rotor lead and yellow stator lead of resolver B2003, terminals 3 and 7 of terminal board TB2002.

Step 4. Loosen the three slotted screws (item 217, figure 9-10, sheet 3 of 3) securing the case of resolver B2003.

Step 5. Apply 26 volts, 400 cps hot lead to red rotor lead of resolver B2003, terminal 3 of terminal board TB2002.

CAUTION

Apply power only long enough to make adjustment indicated below.

Step 6. Rotate case of resolver B2003 for a maximum meter reading, about 45 volts ac.

Step 7. Disconnect vtm.

Step 8. Connect vtm between red and black stator leads from resolver B2003, terminals 8 and 9 of terminal board TB2002.

Step 9. Rotate case of resolver B2003 for zero meter reading using lowest voltmeter scale.

Step 10. Secure resolver B2003 by tightening the three case locking screws.

Step 11. Recheck for zero meter reading as in steps 8 and 9.

Step 12. Remove a-c power and vtm connections.

Step 13. Remove ground from terminals 4 and 6 of terminal board TB2002.

g. TILT CONTROL TRANSMITTER SYNCHRO B2005 ZEROING PROCEDURE (ALTERNATE METHOD).

Step 1. Remove cover (6, figure 9-3) from synchro B2005.

Step 2. Remove cover from terminal board TB2003 (5, figure 9-3).

Step 3. Manually adjust tilt position of reflector until tilt zero-degree index marks (6, figure 9-1) coincide. Secure reflector in this position.

Step 4. Apply 26 volts, 400 cps grounded lead to terminal 8 of terminal board TB2001 (13, figure 9-5).

Step 5. Connect a-c vtm between blue and yellow stator leads from synchro B2005, terminals 4 and 5 of terminal board TB2003 (5, figure 9-3).

Step 6. Apply 26 volts, 400 cps hot lead to terminal 2 of terminal board TB2003.

CAUTION

Apply power only enough to make adjustment indicated below.

Step 7. Rotate case of synchro B2005 for zero meter reading.

Step 8. Switch vtvn lead from blue stator lead (terminal 4 of terminal board TB2003) to black rotor lead (terminal 2 of terminal board TB2003) of synchro B2005.

NOTE

If antenna is wired for normal mounting (base above reflector) perform steps 9 through 13 only. If antenna is wired for inverted mounting (reflector above base) perform step 14 next.

Step 9. If meter reads about 36 volts ac perform step 11 next. If meter reads about 15 volts ac perform step 10 next.

Step 10. Rotate case of synchro B2005, 180 degrees through maximum meter reading to second null and repeat steps 5, 6, and 7. Recheck steps 8 and 9.

Step 11. Repeat steps 5, 6, and 7 using lowest voltmeter scale.

Step 12. Secure synchro B2005 by tightening the three case locking screws.

Step 13. Recheck for zero meter reading as in steps 5, 6, and 7. Perform step 19 next.

Step 14. If meter reads about 15 volts ac perform step 16 next. If meter reads about 36 volts ac perform step 15 next.

Step 15. Rotate case of synchro B2005 180 degrees through maximum meter reading to second null and repeat steps 5, 6, and 7. Recheck steps 8 and 14.

Step 16. Repeat steps 5, 6, and 7 using lowest voltmeter scale.

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Step 17. Secure synchro B2005 by tightening the three case locking screws.

Step 18. Recheck for zero meter reading as in steps 5, 6, and 7.

Step 19. Remove a-c power. Disconnect vtvm.

Step 20. Replace covers on terminal board TB2003 and synchro B2005.

6-6. CLEANING AND LUBRICATING.

a. GENERAL. --The following cleaning and lubricating information is applicable to both preventive maintenance and overhaul procedures.

b. CLEANING AGENTS REQUIRED. --A supply of compressed air with a nozzle pressure of 60 psi maximum, varsol fluid, and stick charcoal are the only cleaning agents recommended.

c. LUBRICANTS REQUIRED. --The following lubricants are the only ones recommended; their use is itemized in the following paragraphs.

Grease	MIL-G-3278
Grease	MIL-G-7118
Grease	DC-55 Silicone
Oil	Pioneer #10

NOTE

MIL-G-3278 GREASE can be procured as TEXACO UNITEMP or BEACON #325.

MIL-G-7118 can be procured as AEROSHELL #7.

CAUTION

Do not mix greases.

d. CLEANING.

(1) BEARINGS. --Clean bearings in varsol to remove old grease and bake dry at a temperature of 140° F for two (2) hours.

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(2) GEARS. --Clean gears in varsol to remove old grease and air dry with compressed air.

(3) SLIP RINGS. --The slip rings, part of the slip ring and lead assembly (item 319, figure 9-10, sheet 3 of 3) should be inspected for cleanliness during regularly scheduled inspections.

If the slip rings require cleaning it is recommended that stick charcoal only be used. Do not use solvents.

In-plane inspections of slip rings can be made by removing the brush cover (item 233, figure 9-10, sheet 3 of 3) and the wiper arm assembly (item 236). During overhaul the entire torque tube, slip ring, and drive assembly (item 299) should be removed for cleaning and relubrication.

(4) BASE ASSEMBLY. --The base assembly (figure 9-5), can be blown clean with compressed air after all motors, synchros, gears, and bearings are removed.

e. LUBRICATION.

(1) MOTORS AND SYNCHROS. --Relubricate the bearings in all motors and synchro units at time of overhaul only with Pioneer #10 oil. Check bearings for wear and replace if defective.

(2) AZIMUTH DRIVE GEAR ASSEMBLY. --The six bearings (item 294, figure 9-8) are pre-lubricated, sealed, ball bearing units which cannot be relubricated in the field. Replace if defective. These are the only bearings used in the azimuth drive gear assembly (3, figure 9-5).

The steel gears in the azimuth drive gear assembly (items 265, 279, 284, 287, 288, and 299, figure 9-8) must be lubricated with MIL-G-7118 grease as required. A light coating of grease brushed on is all that is required.

(3) ELEVATION (TILT) DRIVE GEAR ASSEMBLY. --The elevation drive gear assembly (1, figure 9-2) contains ten ball bearing assemblies and a gear train,

all completely enclosed. Relubricate only if the mechanism binds, in view of the extensive disassembly required. If the unit is disassembled at time of overhaul, complete cleaning and relubrication can then be accomplished. Use MIL-G-3278 grease for bearings; MIL-G-7118 grease for gears.

(4) ROD END BEARINGS.--The bearings (3 and 5, figure 9-2) on each end of connecting rod (4) are pre-lubricated, sealed, ball bearing assemblies which cannot be relubricated in the field. Replace as necessary.

(5) AZIMUTH DRIVE (BULL) GEAR.--The azimuth drive gear (2, figure 9-6) can be lubricated by simply removing the gear cover (item 240, figure 9-10, sheet 3 of 3) and brushing the gear with a light coating of MIL-G-7118 grease. This gear is also shown as item 320 in figure 9-10, sheet 3 of 3.

(6) TORQUE TUBE BEARINGS.--Lubricate the upper torque tube bearing (item 316, figure 9-10, sheet 3 of 3) as required, with MIL-G-3278 grease.

The lower torque tube bearing (item 310) is a pre-lubricated, sealed, ball bearing assembly which cannot be relubricated in the field. Replace if defective.

(7) SPLIT GEARS.--The aluminum split gears within the antenna base (7 and 14, figure 9-5) should not be lubricated.

(8) FRAME BEARINGS.--The frame assembly (item 195, figure 9-10, sheet 2 of 3) uses two ball bearings (items 157 and 162). These two bearings are pre-lubricated, sealed, ball bearing units which cannot be relubricated in the field. Replace if defective.

(9) ROTARY JOINT.--Lubrication of parts of the rotary joint (item 51, figure 9-10, sheet 1 of 3) with DC-55 silicone grease is covered in detail in paragraph 6-2d, steps 6 and 7.

6-7. DISASSEMBLY FOR OVERHAUL.

a. GENERAL.--There is no complete fixed sequence for disassembly of the ANT-1() Antenna. Examination of the exploded view drawings (figure 9-10, sheets

1, 2, and 3) will show that several sequences are possible for complete disassembly. It is essential, however, that certain items be removed before certain other items can be removed.

It is the intention of this paragraph to outline a logical approach to disassembly and to call out those items which are indicated for early removal.

Each item in the exploded view drawings is numbered and the item numbers are keyed to a group assembly parts list appearing in section VIII of this handbook.

b. MAJOR SECTIONS.--The antenna can be separated into two major sections for easier and safer handling - the complete base assembly (shown on sheet 3 of 3, figure 9-10), and the complete frame and reflector assembly (shown on sheets 1 and 2 of figure 9-10).

NOTE

Separation of the base and frame should not be done for anything less than a complete overhaul or the replacement of damaged parts which cannot be reached otherwise.

c. SEPARATION PROCEDURE.

Step 1. Remove waveguide section (4, figure 9-3) by removing eight screws and lockwashers (items 42 and 43, figure 9-10, sheet 1 of 3).

Step 2. Disconnect from terminal boards TB2003 and TB2004 (5 and 10, figure 9-3) all connections from the two input cables (14).

Step 3. Remove cable cover plate (item 192, figure 9-10, sheet 2 of 3) by removing four screws and lockwashers (items 193 and 194).

Step 4. Unthread input cables (14, figure 9-3) so that they are hanging in front of reflector. Remove cable clamps as necessary and unlace cables so they will not interfere with removal of frame (item 195, figure 9-10, sheet 2 of 3).

Step 5. Remove frame attaching hardware, seven screws and lockwashers (items 196 and 197).

Step 6. Carefully separate frame from base, at the same time feeding cable wires through entry holes in frame.

The above procedure provides two separate major assemblies for further disassembly; namely, the antenna base assembly (figure 9-10, sheet 3 of 3) and the frame and reflector assembly (sheets 1 and 2). Note that the rotary joint is still installed in the base. Removal of the rotary joint is not dependent on the separation of the two major sections as just described. The rotary joint can be removed from the completely assembled antenna as described in paragraph 6-7f(1) after the rear waveguide section (4, figure 9-3) is disconnected.

d. FRAME DISASSEMBLY PROCEDURE. --Removal of reflector from reflector support (item 144, figure 9-10, sheet 2 of 3) is not recommended. The reflector and support should be removed from the frame as an assembly.

Step 1. Remove connecting rod assembly (item 66, figure 9-10, sheet 2 of 3) by removing items 71, 72, 73, and 74 only. Do not separate bearings (item 70) from rod.

Step 2. Remove gear cover (item 132) from frame.

Step 3. Remove split gear and clamp (items 138, 139, and 140) from shaft of synchro (item 169).

Step 4. Remove nut (item 148), lockwasher (item 149), and loosen set-screw (item 150). This will release segment gear and shaft assembly (item 151) which should not be removed before step 5 has been accomplished.

Step 5. Remove cover plate (item 141), nut (item 146) and lockwasher (item 147).

Step 6. Release reflector and reflector support assembly from frame by withdrawing shaft (item 145) and segment gear and shaft assembly (item 151) from their bearings.

Use exploded view drawings (sheets 1, 2, and 3 of figure 9-10) as a guide to further removal of parts from frame assembly.

e. ELEVATION (TILT) DRIVE ASSEMBLY, DISASSEMBLY PROCEDURE.-- Complete disassembly of the elevation drive assembly (item 75, figure 9-10, sheet 2 of 3) is not recommended unless improper operation of the unit makes it necessary. If disassembly is necessary, follow the procedure below after removing the assembly (item 75) from the frame (item 195).

Step 1. Remove drive motor (item 76) by removing three screws (item 77), lockwashers (item 78), and clamps (item 79). Pinion gear (item 80) will be attached to motor shaft.

Step 2. Remove taper pin (item 84) from arm (item 85).

Step 3. Remove arm (item 85) from shaft of segment gear (item 92).

Step 4. Remove three screws (item 90) and lockwashers (item 91). This will separate assembly item 86 from assembly item 99. Further disassembly procedure of item 88 components is self evident.

Step 5. To separate items 100 and 101, to expose inclosed parts, remove six screws (item 103) and lockwashers (item 104). Further disassembly procedure of item 99 components is self evident.

f. BASE ASSEMBLY, DISASSEMBLY PROCEDURE.

(1) REMOVAL OF ROTARY JOINT.

Step 1. Remove input section of rotary joint (item 58, figure 9-10, sheet 1 of 3) by removing four screws (item 56) and lockwashers (item 57). Carefully withdraw rotary joint input section (item 58) by applying a lateral back and forth motion until the section is released. Be careful not to bend or damage the center conductor (item 60 and 61) in the removal process.

NOTE

Save shims (item 65) for replacement at time of reassembly.

These shims fix the required spacing between the mounting surfaces of the input and output sections of the rotary joint. Item 63-64 is a neoprene air-seal gasket which remains in a groove inside the rotary joint output section (item 59).

Step 2. Remove output section of rotary joint (item 59) by removing four screws (item 56) and lockwashers (item 57).

(2) REMOVAL OF TORQUE TUBE AND SLIP RING ASSEMBLY.

Step 1. Remove wiper arm cover (item 233, figure 9-10, sheet 3 of 3).

Step 2. Remove wiper arm assembly (item 236).

Step 3. Remove torque tube and slip ring assembly (item 299) by removing six screws (item 300) and lockwashers (item 301).

Further disassembly of item 299 is pictured in detail C of figure 9-10, sheet 3 of 3.

(3) REMOVAL OF AZIMUTH DRIVE ASSEMBLY.

Step 1. Remove azimuth drive motor B2001 (9, figure 9-5) by removing three screws, lockwashers, and clamps (items 162, 163, and 164, figure 9-10, sheet 3 of 3).

NOTE

Azimuth drive motor B2001 will still be connected to terminal board TB2001. If it is desired to remove the azimuth drive assembly with drive motor attached, disconnect drive motor leads from terminals 1, 2, and 3 of terminal board TB2001 and unlace wires from cable as required.

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Step 2. Remove four screws (item 258, figure 9-10, sheet 3 of 3), lockwashers (item 259), and flat washers (item 260).

Step 3. Remove two cable clamps (item 295) and one cable clamp (item 296) from top of gear train housing by removing three screws (item 272), lockwashers (item 273) and cable clamp washers (item 298). Replace screws and lockwashers (items 272 and 273) in the gear train housing.

Step 4. Position cables to allow azimuth drive assembly (item 257A) to be lifted clear of base.

NOTE

If azimuth drive assembly is item 257 instead of item 257A, loosen lock nut (item 327 shown in detail B, figure 9-10, sheet 3 of 3) and unscrew adjusting screw (item 326) to release item 257.

Detail A illustrates the complete disassembly of the azimuth drive assembly (item 257 or 257A).

(4) REMOVAL OF AZIMUTH SYNCHRO GENERATOR B2002.--Azimuth synchro generator B2002 (15, figure 9-5) cannot be removed from its mounting plate until split gear (4) is removed from its shaft. This requires the removal of the mounting plate, split gears, and synchro as an assembly. Proceed as follows:

Step 1. Disconnect azimuth synchro generator leads from terminals 5, 6, 7, 8, and 10 of terminal board TB2001 (13, figure 9-5).

Step 2. Remove four screws (item 207, figure 9-10, sheet 3 of 3), and lockwashers (item 208), and one cable clamp washer and cable clamp (item 296).

Step 3. Lift out the complete synchro mounting plate, and split gear assembly. Do not lose the two dowel pins (item 206) which fix the position of the plate (item 205) on the base casting.

(5) REMOVAL OF AZIMUTH RESOLVER. --Azimuth resolver B2003 (5, figure 9-5) cannot be removed from its mounting plate until split gear (7) is removed from its shaft. This requires the removal of the mounting plate, split gear, and resolver as an assembly. Proceed as follows:

Step 1. Disconnect resolver leads from terminals 3, 4, 5, 6, 7, 8, and 9 of terminal board TB2002 (8, figure 9-5).

Step 2. Remove four screws (item 211, figure 9-10, sheet 3 of 3), lockwashers (item 212), and one cable clamp washer and cable clamp (item 297).

Step 3. Lift out the complete resolver, mounting plate, and split gear assembly. Do not lose the two dowel pins (item 210) which fix the position of the plate (item 209) on the base casting.

Further disassembly procedure of the base assembly components is evident from the exploded view drawing (figure 9-10, sheet 3 of 3).

6-8. REASSEMBLY PROCEDURES.

a. GENERAL. --Several illustrations have been prepared to simplify the re-assembly of the ANT-1() Antenna and are included in section IX of this handbook.

Exploded view drawings of the antenna, figure 9-10, consist of three sheets.

Sheet 1 contains a breakdown of the r-f components and reflector assemblies, and contains a table of r-f component part numbers for all ANT-1() Antenna types.

Sheet 2 contains a breakdown of the complete frame assembly, a detailed breakdown of the elevation drive assembly (detail D), a sectional view of the bearing and shaft assembly which supports one side of the reflector support (detail E), and a sectional view of the bearing and shaft assembly which supports the other side of the reflector support (detail F). Detail F also shows the proper assembly of the azimuth synchro generator, split gear, segment gear, and the plate and pointer bearing the tilt index marks.

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Sheet 3 contains a breakdown of the complete base assembly, a detailed breakdown of the azimuth drive unit (detail A) and a detailed breakdown of the torque tube and slip ring assembly (detail C).

A sectional view drawing of the azimuth drive unit, figure 9-8, shows the exact placement of all parts of the unit. The number assigned to each part is the same number used to identify the same part on the exploded view drawings.

Figure 9-9 is a plan view and a stretch-out view of the gear train of the elevation drive unit. Also included in this drawing is a view (detail A) showing the proper alignment of the pinion and sector gears in this unit.

Photographic views of the antenna, figures 9-1 through 9-6, with callouts and legends, identify specific parts.

To reassemble the antenna use the illustrations mentioned above as a guide and observe the following procedural and alignment data.

b. BASE REASSEMBLY.--Use sheet 3 of figure 9-10 as a guide to the reassembly of all small components of the antenna base assembly. Observe the following procedures for reassembling and attaching major subassemblies.

(1) TORQUE TUBE AND SLIP RING ASSEMBLY.--Use detail C of figure 9-10, sheet 3 of 3, as a guide during the following reassembly procedures.

Step 1. Insert bearing (item 310) in bearing seat (item 311).

Step 2. Place bearing retainer (item 312) over bearing and align truncated edges of bearing retainer and bearing seat. Attach item 312 to item 311 with six screws and lockwashers (items 313 and 314).

Step 3. Place assembly just completed on mounting flange (item 306).

Step 4. Set torque tube (item 324) on bearing (item 310) through bearing retainer (item 312). Align the four sets of two holes each in items 324 and 306, and attach items 324 and 306 together with five screws and lockwashers (items 308 and 309).

Step 5. Slip azimuth drive gear assembly (item 320) over torque tube (item 324) with the dowel pin (item 321) projecting toward the base of torque tube. Seat dowel pin in its hole in the base of torque tube and attach gear to torque tube base with five screws and lockwashers (items 322 and 323).

NOTE

Dowel pin (item 321) is a part of the azimuth drive gear assembly (item 320) and is pressed into the gear until just $\frac{3}{32}$ of an inch is left projecting. The dowel pin aligns the four sets of two holes each in the azimuth drive gear and the torque tube base. These eight holes are feed-through holes for the eight wires from the slip ring assembly (item 319).

Step 6. Slide the slip ring assembly (item 319) over the torque tube (item 324) and feed the wire leads from the slip ring assembly through the eight holes in the torque tube base and the mounting flange (item 306).

NOTE

The wire leads of the slip ring assembly are space coded to match the holes through which they are to be fed. This feature establishes the correct angular position of the slip ring assembly on the torque tube.

Step 7. Secure slip ring assembly on torque tube by applying the following items to the torque tube in the order given: spring washer (item 318), spacer (item 317), bearing (item 316), and retaining ring (item 315).

Step 8. Attach azimuth index pointer (item 302) to bearing seat (item 311) with two screws and lockwashers (items 304 and 305).

NOTE

After antenna assembly is complete the position of index pointer (item 302) must be adjusted as per paragraph 6-4b.

(2) MOUNTING OF TORQUE TUBE AND SLIP RING ASSEMBLY.

Step 1. Insert torque tube and slip ring assembly (item 299) into bottom of antenna base casting (item 202) and position azimuth index pointer (item 302) at front of base assembly.

Step 2. Secure item 299 to base with six screws and lockwashers (items 300 and 301).

(3) AZIMUTH SYNCHRO GENERATOR AND AZIMUTH RESOLVER

MOUNTING. --The mounting plates (items 205 and 209) for the azimuth synchro generator B2002 (item 216) and the azimuth resolver B2003 (item 220) are a part of the antenna base casting assembly (item 202). Both plates are accurately located on the base casting with two dowel pins each. The plates (items 205 and 209) are not interchangeable since they have been individually located to provide proper meshing of split gears (item 213) and azimuth drive gear (item 320).

Step 1. Attach azimuth resolver (item 216) to its mounting plate (item 205) using hardware items 217, 218 and 219.

Step 2. Place split gear (item 213) on synchro shaft with collar on gear away from synchro.

Step 3. Apply collar clamp (item 214) over collar on gear and tighten, only slightly, with screw (item 215).

Step 4. Put assembly, completed in step 3, in place on base casting and locate with both dowel pins.

NOTE

The two gear halves of split gear (item 213) must be counter-rotated to align the gear teeth before the split gear can be meshed with azimuth drive gear (item 320).

Step 5. After split gear and azimuth drive gear are meshed, and the synchro, plate, and split gear assembly is fully seated, note where the split gear

rides on the azimuth gear. Adjust the position of the split gear on the synchro shaft so that the split gear teeth ride the center of the azimuth drive gear rim. Then tighten collar clamp screw (item 215).

Step 6. Again place the synchro, plate, and split gear assembly in position on the base casting, but before meshing the split gear and azimuth drive gear counter-rotate the two gear halves of the split gear to expand spring in split gear. Counter-rotation should continue only to the first coincidence of gear teeth after spring action is first apparent. Then mesh split gear and azimuth drive gear.

Step 7. Secure synchro, plate, and split gear assembly to base casting with four screws and lockwashers (items 207 and 208).

NOTE

The same general procedure as above applies to the assembly and mounting of the azimuth resolver, plate, and split gear assembly (items 209 through 215, items 220 through 223, and items 297 and 298).

(4) AZIMUTH DRIVE ASSEMBLY.--Use detail A of figure 9-10, sheet 3 of 3, and figure 9-8 as a guide in the reassembly of the azimuth drive assembly (item 257 or 257A). Since no special tolerances or adjustments are involved, the reassembly procedure for this unit is evident from the detailed information presented in the illustration listed above.

(5) MOUNTING OF AZIMUTH DRIVE ASSEMBLY.--The azimuth drive assembly (item 257 or 257A) mounts on two bosses in the antenna base and is secured with four screws, lockwashers and flat washers (items 258, 259, and 260, figure 9-10, sheet 3 of 3).

Step 1. Mount the azimuth drive assembly (item 257A) in the position shown in figure 9-5, but do not tighten the four mounting screws.

Step 2. Slide the assembly forward until pinion gear (item 284, figure 9-10, sheet 3 of 3) meshes completely with azimuth drive gears (item 320). Then adjust mesh of gear for minimum backlash without binding.

Step 3. Tighten the four mounting screws (item 258) and recheck for binding or excessive backlash.

NOTE

If the azimuth drive assembly is item 257 (early models) instead of item 257A (later models), the screw and locknut shown in detail B of figure 9-10 as items 326 and 327, can be used to fix the gear mesh adjustment as follows.

Step 4. Repeat steps 1 and 2.

Step 5. With locknut (item 327) loose on screw (item 326), run screw into boss (item 274) until screw head just bottoms on base casting. Then tighten locknut (item 327) against base casting. Recheck for binding or excessive backlash.

Step 6. Tighten the four mounting screws (item 258).

(6) MOUNTING BRUSH ASSEMBLY.--The brush assembly (1, figure 9-6) must not be mounted until the slip ring assembly (item 299, figure 9-10, sheet 3 of 3) is in place in the base assembly.

Step 1. Mount brush assembly (item 236) on the antenna base casting using four screws, lockwashers, and flat washers (items 237, 238, and 239).

Step 2. Check to see that all brushes are properly seated on their slip rings and that normal brush wear between inspections will not cause the brushholder or spring arm to contact slip ring. Make sure no part of brushholders or spring arms rubs against the slip ring separating barriers.

(7) LEAD DRESS.--After the antenna base assembly is reassembled, dress the cables and leads as shown in figure 9-5, using cable clamps and lacing as shown.

c. FRAME REASSEMBLY.--Use sheet 2 of figure 9-10 as a guide to the reassembly of all small components of the antenna frame assembly. Observe the following procedures for reassembling and attaching major subassemblies.

(1) ELEVATION DRIVE ASSEMBLY. --Use detail D of figure 9-10, sheet 2 of 3, and figure 9-9 during the following reassembly procedures.

Step 1. Before assembling the gears in gear housing (item 99, detail D) check to see that press pin (item 110) is firmly seated in the shaft of gear (item 109) and that it projects out of the shaft to a distance of .090 +.000 -.005 inches.

Step 2. Support housing assembly (item 100, figure 9-10), horizontally, about 2 inches above work bench.

Step 3. Insert three bearings (item 112) in bearing holes of item 100 at B, C, and D axis. See figure 9-9.

Step 4. Drop pinion gear of gear assembly (item 108) through insert at axis E of item 100.

Step 5. Place lever arm (item 111) on shaft of gear assembly (item 108) so that projection of press pin (item 110) occupies semi-circular cutout section of item 111. Orient flat surface of item 111 toward rim of housing (item 100).

Step 6. Insert shaft of spur gear (item 106) in bearing at C axis with large gear next to bearing.

Step 7. Insert shaft of spur gear (item 105) in bearing at B axis, meshing pinion gear of item 105 with large gear of item 106.

Step 8. Insert shaft of spur gear (item 107) in bearing at D axis, meshing pinion gear of item 107 with large gear of item 108, and large gear of item 107 with pinion gear of item 106.

Step 9. Attach lever arm stop (item 113) to housing plate (item 101) with two screws and lockwashers (items 114 and 115).

Step 10. Insert three bearings (item 112) in housing plate (item 101), one each at axis B, C, and D.

Step 11. Insert eccentric bushing (item 120) and shims (item 119) in housing place (item 100) at axis E.

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Step 12. Insert bearing (item 112) in eccentric bushing (item 120).

Step 13. Install eccentric cover (item 121) over eccentric bushing (item 120), using two screws and lockwashers (items 122 and 123) to attach.

Step 14. Install bearing cover (item 116) over bearing at axis D of housing plate (item 101), using two screws and lockwashers (items 117 and 118) to attach.

Step 15. Assemble gear housing (item 100) and housing plate (item 101) by aligning dowel pins (item 102) and dowel pin holes in gear housing (item 100) and housing plate (item 101). Feed gear shafts into proper bearings and secure assembly with six screws and lockwashers (items 103 and 104).

Step 16. Place housing (item 87) over gear housing (item 100) seating the hole at axis E over the insert bushing and align the three screw holes in each housing section.

Step 17. Insert bearing (item 94) into bearing hole in housing (item 87).

Step 18. Insert short end of segment gear shaft (item 92) into bearing just installed.

NOTE

At this point alignment of segment gear (item 92) and pinion gear of gear assembly (item 108) must be performed. Refer to detail A of figure 9-9 which shows the proper alignment of the two gears.

Step 19. Insert eccentric bushing (item 95) in housing cover (item 88) at axis E.

Step 20. Install eccentric cover (item 96) over eccentric bushing just installed. Secure cover with three screws and lockwashers (items 97 and 98).

Step 21. Insert bearing (item 94) into eccentric bushing (item 95).

Step 22. Insert bearing (item 93) into bearing hole in housing cover (item 88).

Step 23. Assemble housing (item 87) and housing cover (item 88). This may require rotation of eccentric bushing (item 95) to allow segment gear (item 92) and the pinion of gear assembly (item 108) to mesh when their shafts are inserted in their bearings. Use two dowel pins (item 89) to accurately align items 87 and 88.

Step 24. Secure assembly 86 to assembly 99 with three screws and lockwashers (items 90 and 91).

Step 25. Adjust eccentric bushings (items 95 and 120) to obtain maximum backlash between gears of gear assembly 108, segment gear (item 92) and the pinion of spur gear (item 107).

Step 26. Shim eccentric bushing (item 120) with proper thickness shims (item 119) to provide gear assembly (item 108) with end play of $.004 \pm .001$ inch. Refer to figure 9-9, note 2.

Step 27. After proper end play has been established, loosen eccentric bushing covers (items 96 and 121) and rotate eccentric bushings to obtain minimum backlash, without binding, between large gear of item 108 and pinion gear of item 107, and pinion gear of item 108 and segment gear of item 92. Then tighten eccentric bushing covers (items 96 and 121) to lock the eccentric bushings in their adjusted positions.

Step 28. Assemble the two spring loaded plunger assemblies (item 124), by inserting plunger (item 126) and spring (item 127) in plunger case (item 125) and compressing spring with retaining screw (item 128). Turn retaining screw into plunger case until top of screw is 3/16 inch below top of case.

Step 29. Screw two spring loaded plunger assemblies (item 124) into gear housing (item 100), each to a depth which produces a buffer action on lever arm (item 111) before it bottoms on stop plate (item 113). Buffer action can be determined by rotating lever arm (item 85) clockwise and counterclockwise until lever

arm (item 111) contacts the spring loaded plungers. Proper buffer action will cause lever arm (item 85) to rebound about 1/32 inch after lever arm (item 111) bottoms.

Step 30. Lock each of the two plunger cases in their adjusted positions with locknuts (item 129).

Step 31. Install pinion gear (item 80) on shaft of tilt drive motor B2004 (item 76) and secure pinion with nut and lockwasher (items 81 and 82).

Step 32. Attach tilt drive motor B2004 (item 76) to elevation drive assembly with three screws, lockwashers, and clamps (items 77, 78, and 79).

(2) MOUNTING ELEVATION DRIVE ASSEMBLY TO FRAME.

Step 1. Position elevation drive assembly (item 75) on antenna frame in the position shown in figure 9-2(1), and in figure 9-3(12).

Step 2. Attach elevation drive assembly (item 75) to frame (item 195) with three screws and lockwashers (items 130 and 131).

(3) MOUNTING TILT SYNCHRO GENERATOR.

Step 1. Seat tilt synchro generator B2005 (item 169) in antenna frame (item 195) in the position shown in figure 9-3(6).

Step 2. Attach item 169 to frame with three screws, lockwashers, and clamps (items 170, 171, and 172).

NOTE

Do not install synchro cover (item 165) at this time since the synchro will require zeroing after antenna is completely assembled.

d. MOUNTING FRAME TO BASE.

NOTE

Prior to combining base and frame, a determination of shim (item 65, figure 9-10, sheet 1 of 3) requirements

must be made. The shims used must fix the distance between the rotary joint's upper and lower mounting plates at 4.281 inches as shown in figure 9-11. Use a 5-inch micrometer, or its equivalent, to measure the separation distance of the surfaces indicated in figure 9-11 and add shims (item 65) until a total measured separation of 4.281 inches is achieved. Retain selected shims for use when installing upper section of rotary joint (item 58, figure 9-10, sheet 1 of 3).

Step 1. Mate the antenna frame (item 195, figure 9-10, sheet 2 of 3) to the antenna base by aligning the seven holes in the frame head with the seven holes in the mounting flange assembly (item 306, figure 9-10, sheet 3 of 3).

Step 2. Secure frame to base with seven screws and lockwashers (items 196 and 197, figure 9-10, sheet 2 of 3).

(1) INSTALLING ROTARY JOINT.

Step 1. Install lower section of rotary joint (item 59, figure 9-10, sheet 1 of 3) in antenna base and secure with four screws and lockwashers (items 56 and 57).

NOTE

The mounting flange on the lower section of the rotary joint has four semi-circular cutouts around its edge and the wires from the slip ring assembly must fall, two wires each, through these cutouts. See figure 9-12.

Step 2. Place shims (item 65) discussed in paragraph 6-8c(4) next to rotary joint mounting boss on antenna base casting.

Step 3. Insert center conductor of rotary joint (17, figure 9-5) in rotating section of rotary joint (1). Carefully lower center conductor until mounting flange of rotary joint upper section is about one inch from mounting boss on antenna base.

Step 4. Orient rotary joint input flange (18) to any desired optional position. See detail A of figure 3-1. Then align the holes in the rotary joint mounting flange, shims, and mounting boss.

Step 5. Carefully seat rotary joint upper section, making sure center conductor seats properly in door-knob coupler in base of rotary joint lower section.

Step 6. Secure upper section of rotary joint to base with four screws and lockwashers (items 56 and 57, figure 9-10, sheet 3 of 3).

(2) CABLE DRESS.--Use figure 9-12 as a reference for the following cabling instructions.

Step 1. Form the eight wire leads from the slip ring assembly into two cables of four wires each as follows.

Step 2. Dress leads from slip rings numbers 1, 2, 4, and 5 to assemble cable leading to terminal board TB2003 as shown in figure 9-12.

Step 3. Dress leads from slip rings numbers 3, 6, 7, and 8 to assemble cable leading to terminal board TB2004.

Step 4. Add a common black-white lead as a jumper from terminal 1 of TB2003 to terminal 1 of TB2004.

Step 5. Form the eight leads from the slip rings and the jumper lead around a 1-3/16-inch radius as shown in figure 9-12, and lace.

Step 6. Cover the resulting two cables, of five wires each, with phenoflex tubing and feed each cable through holes and rubber grommets provided in antenna frame as shown in figures 9-3(14) and 9-12.

Step 7. Apply cable cover plate (item 192, figure 9-10, sheet 2 of 3) over the semi-circle of laced wires and secure cover plate with four screws and lockwashers (items 193 and 194). One end of the phenoflex tubing must be clamped securely under the slightly bent tips of the cover plate (item 192).

Step 8. Connect the five leads from each cable to terminal boards TB2003 and TB2004 as indicated in figure 9-12.

e. MOUNTING REFLECTOR AND REFLECTOR SUPPORT ASSEMBLY. --Use figure 9-10, sheet 2 of 3, as a guide during the following procedure.

Step 1. Insert retaining ring (item 164), spacer (item 163), bearing (item 162), and bearing retainer (item 159), into arm of frame (item 195) in that order.

Step 2. Secure item 159 with two screws and lockwashers (items 160 and 161), each in opposite holes of item 159.

Step 3. Insert sleeve (item 158) into same arm of frame but from opposite end.

Step 4. Insert bearing (item 157) into bushing in opposite arm of frame.

Step 5. Attach pointer (item 152) to segment gear (item 151) with one screw, lockwasher, and flat washer (items 153, 154, and 155).

Step 6. Feed shaft of segment gear (item 151) through bearing (item 157) and place sleeve (item 156) on shaft of item 151.

Step 7. Set reflector and reflector hanger assembly in place between the two arms of the frame assembly.

Step 8. Insert shaft (item 145) through bearing (item 162) and sleeve (item 158) and through tilt axis hole in reflector support (item 144).

Step 9. Insert shaft of segment gear through opposite tilt axis hole in reflector support.

Step 10. Secure shaft (item 145) with one nut and lockwasher (items 146 and 147).

Step 11. Align keyway in shaft of segment gear (item 151) with point of setscrew (item 150) in reflector support (item 144) and fully seat segment gear and shaft assembly, locking shaft in position with setscrew and securing shaft with one nut and lockwasher (items 148 and 149).

Step 12. Install cover plate (item 141) over shaft (item 145) with two screws and lockwashers (items 142 and 143).

Step 13. Install connecting rod and bearing assembly (item 66) between lever arm (item 85) of elevation drive assembly (item 75) and elevation drive arm of reflector support (item 144). Use nut, lockwasher, flat washer (items 72, 73, and 74) to attach upper bearing of connecting rod assembly to lever arm of elevation drive assembly. Use screw, lockwasher, and nut (items 71, 72, and 73) to attach lower bearing of connecting rod assembly to elevation drive arm of reflector support. See 3 and 5 of figure 9-2.

Step 14. Attach index bracket (item 135) to antenna frame assembly in tilt indicator housing with two screws and lockwashers (items 136 and 137).

Step 15. Attach split gear assembly (item 138) to shaft of tilt control transmitter (item 169) using collar clamp (item 139) and screw (item 140). Items 139 and 169 must mesh.

NOTE

Before meshing split gear (item 138) and segment gear (item 151) counter-rotate the two gear halves of split gear to expand spring. Counter-rotate only to first coincidence of gear teeth after spring action is first apparent. Then mesh teeth of split gear with teeth of segment gear. Center teeth of split gear on rim of segment gear and tighten collar clamp (item 139).

Step 16. Install cover (item 132) over tilt indicator housing on frame and secure with five screws and lockwashers (items 133 and 134).

NOTE

Detail F, figure 9-10 is a sectional view of the complete tilt control transmitter drive and tilt indicator assembly showing the exact placement of components.

Note that tilt index marks must be realigned after re-assembly of antenna is complete.

f. CONNECTING WAVEGUIDE AND FEED SECTION.

(1) FEED SECTION. --The feed section (item 52, figure 9-10, sheet 1 of 3) mounts to the antenna frame from the rear as shown in figure 9-10, sheet 2 of 3. The radiator end of the feed section fits through the circular opening in the antenna frame and through the reflector support. The feed section can be mounted and removed with the full reflector assembly in place.

The feed section must be mounted so that the E plane of the input flange is horizontal to match the E plane of the output flange of the connecting section of rectangular waveguide (item 141, figure 9-10, sheet 1 of 3).

Four screws (item 53) and four lockwashers (item 54) secure the feed section to the antenna frame.

(2) CONNECTING WAVEGUIDE SECTION. --A connecting waveguide section consisting of rigid waveguide, as shown in figure 9-3(4), was used on early model ANT-1() Antennas. Later models use an assembly composed of a flexible elbow section (item 44, figure 9-10, sheet 1 of 3), an axial twist and 90-degree H-plane bend section (item 45), and an r-f and pressure gasket (item 46-47). An additional r-f and pressure gasket (item 50-51) is required at the input flange and at the output flange regardless of the type of connecting waveguide used.

The connecting waveguide section or assembly (item 41) attaches between the rotary joint output flange and the feed section input flange and each connection is secured with eight screws and lockwashers (items 42 and 43).

g. ELECTRICAL CONNECTIONS. --Make all electrical connections in accordance with the schematic diagram of the ANT-1() Antenna, figure 9-7 for all antennas intended for normal mounting, that is, base above reflector. If the antenna is to be mounted inverted, that is, reflector above base, refer to paragraph 3-2b and make the wiring changes indicated therein.

6-9. CHECK LIST, ANT-1() ANTENNA TESTS AND ADJUSTMENTS.

a. GENERAL. --The following check list is intended as a guide to the performance of those tests necessary to check the performance of type ANT-1() Antennas. The list is in three parts. The first part, under paragraph 6-9b, can be performed on the test bench. The second part, under paragraph 6-9c, requires an antenna range equipped for microwave beam and power measurements and VSWR measurements. The third part must be accomplished with the antenna installed in a complete system mock-up or in an aircraft.

b. BENCH CHECKS.

TEST
CONTINUITY
ALIGNMENT OF AZIMUTH AND
ELEVATION ZERO-DEGREE
INDEX MARKS

PARAGRAPH REFER-
ENCE AND REMARKS

Paragraph 6-3c. (table 6-2)

Azimuth

Paragraph 6-4b.

Elevation (tilt)

Paragraph 6-4c.

SYNCHRO AND RESOLVER ZEROING

Azimuth synchro generator B2002

Paragraph 6-5b or c.

Azimuth resolver B2003

Paragraph 6-5c or f.

Tilt control transmitter B2005

Paragraph 6-5d or g.

LUBRICATION

Paragraph 6-6e.

AIR LEAKAGE

The antenna waveguide system must be sufficiently tight to restrict leakage of air to a maximum of 2 cubic inches per minute when the pressure differential between the inside and outside of the waveguide is one atmosphere.

TILT LIMITS

Tilt limiting stops in the elevation drive assembly must allow the reflector to be tilted to at least plus and minus 15 mechanical degrees without allowing the reflector to hit the antenna frame.

NOTE

The tilt index marks as seen through the tilt index window (6, figure 9-1) indicates electrical, not mechanical, degrees.

c. R-F TESTS.--Where an antenna range and proper test equipment is available the following r-f tests can be made. If the antenna efficiency is down due to faults, either electrical or mechanical, which cannot be readily corrected by the field service organization, the antenna should be returned to the Bendix factory for repair and adjustment. No equipments should be returned to the Bendix factory until a return authorization (RA) form is requested and received (refer to paragraph 6-1).

<u>TEST</u>	<u>RESULT REQUIRED</u>
BEAM WIDTH	Refer to table 1-1.
VSWR	Refer to table 1-1.
SIDE LOBES	Refer to table 1-1.
GAIN	Refer to table 1-1.
BEAM ROTATION (ferrite rotator)	Refer to table 1-1.
CSC ² BEAM PATTERN	Refer to table 1-1.

d. OPERATIONAL TESTS.--Follow the procedures outlined in paragraph 3-4d of the system instruction book for tests of the antenna under actual operational conditions.

SECTION VII

SUPPLEMENTARY DATA AND MODIFICATIONS

7-1. GENERAL.

The Bendix Type ANT-1() Antennas include models designed for X-band and C-band operation. Both X- and C-band antennas are available with various optional mounting accessories.

The table in figure 3-2 lists the various types of C-band antennas available and the optional accessories supplied with each type.

The table in figure 3-3 lists the various types of X-band antennas available and the optional accessories supplied with each type.

Table 7-1, below, lists the major differences in the basic antenna types.

TABLE 7-1.
COMPARISON OF BASIC ANTENNA TYPE FEATURES

TYPE	OPERATING BAND	REFLECTOR DIAMETER (INCHES)	FOCAL LENGTH (INCHES)	PENCIL BEAM	CSC ² BEAM
ANT-1B()	X	22	8	YES	YES
ANT-1C()	C	22	8	YES	NO
ANT-1D()	C	30	10.6	YES	NO
ANT-1E()	X	30	10.6	YES	YES

7-2. WAVEGUIDE MODIFICATION.

Current model antennas are equipped with a waveguide connecting assembly consisting of an elbow section of flexible waveguide and an axial twist section of rigid waveguide, replacing the original axial twist section of rigid waveguide (4, figure 9-4).

The main purpose of this change is to increase service life of the r-f system under extreme conditions of vibration on the antenna installation.

If the antenna is equipped with the former rigid assembly it is perfectly satisfactory for continued use. When a replacement is necessary the newer combination of flexible and rigid waveguide is recommended.

Table 7-2 lists the part numbers for the replacement waveguide sections, or assembly, for all ANT-1() Antenna types.

TABLE 7-2.
REPLACEABLE WAVEGUIDE SECTIONS AND ASSEMBLIES

FOR ANTENNA TYPE	OPERATING BAND	WAVEGUIDE PART NUMBERS		
		1 FLEXIBLE ELBOW	2 RIGID TWIST SECTION	3 ASSEMBLY 1 + 2
ANT-1B()	X	1264154-1	1264155-1	1264153-1
ANT-1C()	C	1275624-1	1275626-1	1275625-1
ANT-1D()	C	1275624-1	1275626-1	1275625-1
ANT-1E()	X	1264154-1	1264155-1	1264153-1

SECTION VIII

PARTS LIST

8-1. GENERAL.

This section contains an electrical parts list covering symbol numbered items of the ANT-1() Antenna. All symbol numbers for parts in the ANT-1() Antenna fall within the 2000 to 2999 series.

A group assembly parts list follows the electrical parts list and the parts index numbers are keyed to item numbers in exploded view drawings of the antenna, figure 9-10, sheets 1, 2, and 3.

ELECTRICAL PARTS LIST: TYPE ANT-1A(), ANT-1B(),
ANT-1C(), ANT-1D(), AND ANT-1E() ANTENNAS

SYMBOL DESIG- NATION	NAME OF PART AND DESCRIPTION	BENDIX PART NUMBER
B2001	Motor, azimuth drive	CK-2006-9-A1
B2002	Generator, azimuth synchro data	AY-201S-25B
B2003	Resolver, azimuth	AY-221S-38B
B2004	Motor, tilt drive	CK-2006-3-A1
B2005	Generator, tilt synchro data	AY-201S-25B
C2001	Capacitor, phasing: 0.68 uf, 600 VDCW	1238123-1
C2002*	Capacitor, storage: 0.15 uf, 200 VDCW	1260358-1
L2001**	Coil, ferrite energizing	1247328-1
L2002*	Inductor: 5h at 1000 cps	1261106-1
P2001	Connector, electrical: AN3102E-36-7P	O-415-600
R2001*	Resistor, limiting: 228 ohms, $\pm 1\%$, 1 w, ww	1260749-3
S2001	Switch, azimuth drive motor: dpst toggle	ST-50K
S2002	Switch, tilt drive motor: dpst toggle	ST-50K
TB2001	Terminal board: 13 double terminals	1222624-1
TB2002	Terminal board: 13 double terminals	1222624-1
TB2003	Terminal board: 5 double terminals	1222624-2
TB2004	Terminal board: 5 double terminals	1222624-2
TB2005*	Terminal board: 3 double terminals	1280172-1
Z2001	Degausser assembly (includes C2002, L2002, R2001, TB2005)	1280173-1
* Part of degausser assembly Z2001[used in ANT-1B() and ANT-1E() types only] ** Part of r-f feed section		

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10.
ANT-1B(), -1C(), -1D(), AND -1E() ANTENNAS, PART OF
RDR-1 AIRBORNE RADAR SYSTEM

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
1 OR 2	See Table 8-1 at end of this section	ANT-1() ANTENNA	1
3	MFIL-0-1007SCP	. REFLECTOR (22-inch diameter)	1
4	AN935-0	. REFLECTOR (30-inch diameter)	1
5	MFIL-0-606SCP	 ATTACHING PARTS	6
6	AN935-6	. SCREW	6
7	W-0-6	. LOCKWASHER	4
8	1247315	. SCREW	4
		. LOCKWASHER	4
		. WASHER, FLAT	4
		. WASHER, SPACING	AS REQUIRED
9	1247322-1	— 0 —	
		. GRID, BEAM FORMING (For item 1, X-band only)	1
10	MR-0-607-SCP	 ATTACHING PARTS	4
11	AN935-6	. SCREW	4
12	W-0-6	. LOCKWASHER	4
13	1247315	. WASHER, FLAT	4
14	W-0-4	. WASHER, SPACING	AS REQUIRED
15	AN935-4L	. WASHER, FLAT	2
16	N-0-4SCP	. LOCKWASHER	2
17	R-0-405SCP	. NUT	2
18	AN935-4L	. SCREW	2
		. LOCKWASHER	2

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
19	W-0-4	. WASHER, FLAT	2
20	AN960PD4L	. WASHER, SPACING	2
21	AN960PD4	. WASHER, SPACING	2
22	W-0-4	. WASHER, FLAT	2
23	1247326-1	. SPACER, THREADED	2
24	W-0-4	. WASHER, FLAT	2
25	AN935-4L	. LOCKWASHER	2
26	N-0-4SCP	. NUT	2
		— 0 —	
27	1255785-1	. GRID, BEAM FORMING (For item 2, X-band only)	1
		 ATTACHING PARTS	
28	R-0-404SCP	. SCREW	2
29	W-0-4	. WASHER, FLAT	2
30	W-0-4	. WASHER, FLAT	2
31	AN935-4L	. LOCKWASHER	2
32	N-0-4SCP	. NUT	2
33	R-0-404SCP	. SCREW	4
34	AN935-4L	. LOCKWASHER	4
35	W-0-4	. WASHER, FLAT	4
36	1255783-2	. SPACER, THREADED	2
37	1255783-1	. SPACER, THREADED	2
38	W-0-4	. WASHER, FLAT	4
39	AN935-4L	. LOCKWASHER	4
40	R-0-404SCP	. SCREW	4
		— 0 —	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
41	See table 8-1 at end of this section.	. WAVEGUIDE ASSEMBLY	1
42	MASH-0-806SCP	 ATTACHING PARTS	16
43	AN935-8	. SCREW	16
		. LOCKWASHER	
		— 0 —	
44	See item 41.	. . WAVEGUIDE, FLEXIBLE L SECTION	1
45	See item 41.	. . WAVEGUIDE, AXIAL TWIST SECTION	1
46	1247349-1	. . RF AND PRESSURE GASKET (X-band only)	1
47	1247321-1	. . RF AND PRESSURE GASKET (C-band only)	1
48	MASH-0-807SCP	. . SCREW	8
49	AN935-8	. . LOCKWASHER	8
50	1247349-1	. . RF AND PRESSURE GASKET (X-band only)	2
51	1247321-1	. . RF AND PRESSURE GASKET (C-band only)	2
52	See table 8-1 at end of this section.	. WAVEGUIDE FEED SECTION	1
		 ATTACHING PARTS	
53	MASH-0-1012SCP	. SCREW	4
54	AN935-10	. LOCKWASHER	4
		— 0 —	
55	See table 8-1 at end of this section.	. ROTARY JOINT ASSEMBLY	1
		 ATTACHING PARTS	
56	MASH-0-808SCP	. SCREW	8
57	AN935-8	. LOCKWASHER	8
		— 0 —	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
58	Part of item 55, not available separately	. . ROTARY JOINT, STATIONARY SECTION	1
59	Part of item 55, not available separately	. . ROTARY JOINT, ROTATING SECTION	1
60	402756*	. . CENTER CONDUCTOR, ROTARY JOINT (X-band only)	1
61	404101*	. . CENTER CONDUCTOR, ROTARY JOINT (C-band only)	1
62	1264156-1	. . GASKET, PRESSURE SEAL (X-band only)	1
63	26607*	. . "O" RING, AIR SEAL (X-band only)	1
64	26607*	. . "O" RING, AIR SEAL (C-band only)	1
65	1222652-()	. SHIMS (-1 = .003, -2 = .005, -3 = .010 inches thickness)	AS REQUIRED
66	1247297-1	. ROD AND BEARING ASSEMBLY	1
67	1247296-1	. . ROD	1
68	AN316-C4R	. . NUT	2
69	RP-94-437SCP	. . ROLL PIN	2
70	1247271-1	. . BEARING ASSEMBLY	2
71	AN3-C10A	 ATTACHING PARTS FOR ITEM 66	
72	AN935-10	. BOLT	1
73	AN345-10	. LOCKWASHER	2
74	AN960-10L	. NUT	2
		. WASHER, FLAT	1
		----- 0 -----	
75	1247291-1	. ELEVATION DRIVE UNIT	1
76	CK-2006-3-A1	. . MOTOR, TILT DRIVE (B2004)	1

*AIRTRON PART NUMBERS

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
77	MFIL-0-609SCP	 ATTACHING PARTS	
78	AN935-6	. . SCREW	3
79	1222617-2	. . LOCKWASHER	3
		. . CLAMP, MOTOR	3
		— 0 —	
80	1222665-1	. . GEAR, MOTOR PINION	1
		 ATTACHING PARTS	
81	AN345-4	. . NUT	1
82	AN935-4	. . LOCKWASHER	1
		— 0 —	
83	1247270-1	. . SECTOR AND ARM ASSEMBLY (Includes items 84, 85 and 92 as a matched assembly)	1
84	TP-0-3016SS	. . . TAPER PIN (Part of item 76)	1
85	Part of item 83, not available separately	. . . ARM, LEVER	1
86	1247283-1	. . HOUSING ASSEMBLY, DOWELLED (Matched set)	1
87	Part of item 86, not available separately	. . . HOUSING	1
88	Part of item 86, not available separately	. . . COVER, HOUSING	1
89	PRSS-792-35B	. . . DOWEL PIN (Part of item 86)	2
90	MMFIL-0-811 1/2SCP	 ATTACHING PARTS FOR ITEM 86	
91	AN935-8L	. . SCREW	3
		. . LOCKWASHER	3
		— 0 —	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
92	Part of item 83, not available separately	. . . SECTOR GEAR AND SHAFT ASSEMBLY	1
93	1255392-1	. . BEARING, BALL	1
94	1255393-1	. . BEARING, BALL	2
95	1255406-1	. . ECCENTRIC, BEARING MOUNTING (Do not confuse with item 120)	1
96	1255405-1	. . COVER, ECCENTRIC LOCKING	1
97	FFIL-0-403SCP	 ATTACHING PARTS	3
98	AN935-4L	. . SCREW	3
		. . LOCKWASHER	
		— 0 —	
99	1247286-1	. . HOUSING AND PLATE ASSEMBLY, DOWELLED (Matched set)	1
100	Part of item 99, not available separately	. . . HOUSING ASSEMBLY	1
101	Part of item 99, not available separately	. . . PLATE, HOUSING ASSEMBLY	1
102	PRSS-948-31B	. . . DOWEL PIN (Part of item 99)	2
103	MFIL-0-806SCP	. . . SCREW (Part of item 99)	6
104	AN935-8L	. . . LOCKWASHER (Part of item 99)	6
105	1255395-1	. . GEAR, SPUR	1
106	1255396-1	. . GEAR, SPUR	1
107	1255397-1	. . GEAR, SPUR	1
108	1247274-1	. . GEAR ASSEMBLY	1
109	1247273-1	. . . GEAR, SPUR	1
110	PRDR-1261-43B	. . . PRESS PIN (Pressed in item 109.) (Let pin project .090" + .000" - .005")	1

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
111	1247276-1	. . ARM, LEVER	1
112	1255394-1	. . BEARING, BALL	7
113	1247275-1	. . STOP, LEVER ARM	1
114	MFIL-0-606 1/2SCP	 ATTACHING PARTS	2
115	AN935-6L	. . SCREW	2
116	1222671-1	. . LOCKWASHER	1
117	MFIL-0-303SCP	— 0 —	2
118	AN935-3	. . PLATE, COVER	2
119	1255404-()	 ATTACHING PARTS	AS REQUIRED
120	1255403-1	. . SHIM, FLAT WASHER (-1 = .002, -2 = .003, -3 = .006 inches thickness)	1
121	1255402-1	. . ECCENTRIC, BEARING MOUNTING (Do not confuse with item 95)	1
122	FFIL-0-403SCP	. . COVER, ECCENTRIC	3
123	AN935-4L	 ATTACHING PARTS	3
124	1247290-1	. . SCREW	2
125	1247287-1	. . LOCKWASHER	2
126	1247288-1	— 0 —	2
127	1247289-1	. . BUFFER, SPRING LOADED PLUNGER ASSY.	2
128	HOS-0-0802RS	. . . CASE, PLUNGER	2
		. . . NOSE, PLUNGER	2
		. . . SPRING, PLUNGER	2
		. . . SCREW, SPRING RETAINING	2

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
129	AN345-416	. . NUT (Locks item 124)	2
130	MASH-0-813 1/2SCP	 ATTACHING PARTS FOR ITEM 75	
131	AN935-8	. SCREW	3
132	1247295-1	. LOCKWASHER	3
		. PLATE, COVER 0 —	1
133	MFIL-0-404SCP	 ATTACHING PARTS	
134	AN935-4L	. SCREW	5
		. LOCKWASHER	5
135	1222611-1	— 0 —	
		. BRACKET, INDEX	1
136	MFIL-0-404SCP	 ATTACHING PARTS	
137	AN935-4	. SCREW	2
		. LOCKWASHER	2
138	1222651-1	— 0 —	
		. GEAR ASSEMBLY, SPLIT	1
139	PB-21444	 ATTACHING PARTS	
140	ASH-0-304SCP	. CLAMP, COLLAR	1
		. SCREW	1
141	1247261-1	— 0 —	
		. COVER	1
142	MFIL-0-606SCP	 ATTACHING PARTS	
143	AN935-6L	. SCREW	2
		. LOCKWASHER	2
144	1247251-1	— 0 —	
		. SUPPORT, PARABOLIC REFLECTOR	1

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
145	1247258-1	 ATTACHING PARTS	
146	AN345-416	. SHAFT	1
147	AN935-416	. NUT	1
148	AN345-416	. LOCKWASHER	1
149	AN935-416	. NUT	1
150	MHCS-0-611SS	. LOCKWASHER	1
151	1247260-1	. SCREW	1
		. SECTOR AND SHAFT ASSEMBLY	1
		— 0 —	
152	1222608-1	. POINTER, INDEX	1
		 ATTACHING PARTS	
153	MF FIL-0-403SCP	. SCREW	1
154	AN935-4	. LOCKWASHER	1
155	AN960-4	. WASHER, FLAT	1
		— 0 —	
156	1247319-1	. SLEEVE	1
157	1222613-1	. BEARING, BALL	1
158	1247318-1	. SLEEVE	1
159	1247298-1	. RETAINER, BEARING	1
		 ATTACHING PARTS	
160	MF IL-0-606SCP	. SCREW	2
161	AN935-6L	. LOCKWASHER	2
		— 0 —	
162	1222613-1	. BEARING, BALL	1
163	1222616-1	. SPACER	1

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
164	T1R-62-SCP	. RING, RETAINING	1
165	1222645-1	. SHIELD ASSEMBLY	1
166	MFIL-0-604SCP	 ATTACHING PARTS	2
167	AN935-6L	. SCREW	2
		. LOCKWASHER	
		— 0 —	
168	1222658-1	. GROMMET	1
169	AY-201S-25B	. SYNCHRO, TILT GENERATOR (B2005)	1
		 ATTACHING PARTS	
170	MFIL-0-395SCP	. SCREW	3
171	AN935-3	. LOCKWASHER	3
172	779897-2	. CLAMP, SYNCHRO	3
		— 0 —	
173	1247293-1	. COVER	2
		 ATTACHING PARTS	
174	MFIL-0-404SCP	. SCREW	4
175	AN935-4L	. LOCKWASHER	4
		— 0 —	
176	1251735-1	. SPACER	4
177	1222638-2	. STRIP, INSULATING	2
178	1222624-2	. STRIP, TERMINAL	2
		 ATTACHING PARTS	
179	MFIL-0-308SCP	. SCREW	8
180	AN935-3	. LOCKWASHER	8
		— 0 —	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
181	1213493-4	. CLAMP, CABLE	1
182	MFIL-0-605SCP	 ATTACHING PARTS	
183	AN935-6	. SCREW	1
184	1213459-3	. LOCKWASHER	1
		. WASHER, CABLE CLAMP	1
		—— 0 ——	
185	1222695-1	. GROMMET	5
186	1264197-1	. ABSORBER, SHOCK	1
187	1280173-1	. DEGAUSSER ASSEMBLY [Used on X-band antennas ANT-1B() and 1E only] (Z2001)	1
188	MFIL-0-606SCP	 ATTACHING PARTS	
189	AN935-6	. SCREW	1
190	MFIL-0-306SCP	. LOCKWASHER	1
191	LW-0-3	. SCREW	2
		. LOCKWASHER	2
		—— 0 ——	
192	1225392-1	. PLATE, COVER	1
193	MFIL-0-605SCP	 ATTACHING PARTS	
194	AN935-6	. SCREW	4
		. LOCKWASHER	4
		—— 0 ——	
195	1247252-1	. FRAME	1
196	MASH-0-1013SCP	 ATTACHING PARTS	
197	AN935-10	. SCREW	7
		. LOCKWASHER	7

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
198	1247300-1	 BASE ASSEMBLY	1
199	1222637-2	 COVER	1
200	MFIL-0-604SCP	 ATTACHING PARTS	6
201	AN935-6	 SCREW	6
		 LOCKWASHER	
		— 0 —	
202	1247305-1	 BASE CASTING ASSEMBLY, DOWELLED (Matched set includes items 203 thru 212)	1
203	1247316-1	 BASE CASTING	1
204	778399-1	 INSERT (Heli-coil)	4
205	Part of item 202, not available separately	 PLATE, SYNCHRO MOUNTING	1
206	PRSS-636-25B	 DOWEL PIN	2
		 ATTACHING PARTS	
207	MASH-0-806SCP	 SCREW	4
208	AN935-8	 LOCKWASHER	4
		— 0 —	
209	Part of item 202, not available separately	 PLATE, RESOLVER MOUNTING	1
210	PRSS-636-25B	 DOWEL PIN	2
		 ATTACHING PARTS	
211	MASH-0-806SCP	 SCREW	4
212	AN935-8	 LOCKWASHER	4
		— 0 —	
213	1222642-1	 GEAR ASSEMBLY, SPLIT	2

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
214	PB21444	 ATTACHING PARTS	
215	MASH-0-304SCP	. . CLAMP, COLLAR	2
		. . SCREW	2
		— 0 —	
216	AY-201S-25B	. . SYNCHRO, AZ GENERATOR (B2002)	1
		 ATTACHING PARTS	
217	MFIL-0-305SCP	. . SCREW	3
218	AN935-3	. . LOCKWASHER	3
219	779897-2	. . CLAMP, SYNCHRO	3
		— 0 —	
220	AY-221S-38B	. . RESOLVER, AZ (B2003)	1
		 ATTACHING PARTS	
221	MFIL-0-305SCP	. . SCREW	3
222	AN935-3	. . LOCKWASHER	3
223	779897-2	. . CLAMP, RESOLVER	3
		— 0 —	
224	1247304-1	. . JUMPER (Used on switch S2001 only)	2
		 ATTACHING PARTS	
225	Part of S2001	. . SCREW	4
226	Part of S2001	. . LOCKWASHER	4
		— 0 —	
227	ST-50K	. . SWITCH, DPST TOGGLE (Spec. JAN-S-23) (S2001, 2)	2
228	1222634-1	. . BRACKET	2
229	1222698-1	. . PLATE, ON-OFF	2

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
230	Part of item 227	 ATTACHING PARTS	
231	Part of item 227	. . NUT	2
		. . LOCKWASHER	2
		— 0 —	
232	AN380-2-5	. . COTTER PIN	2
233	1222643-1	. . COVER, BRUSH	1
		 ATTACHING PARTS	
234	MFIL-0-604SCP	. . SCREW	2
235	AN935-6	. . LOCKWASHER	2
		— 0 —	
236	1219935-1	. . BRUSH ASSEMBLY	1
		 ATTACHING PARTS	
237	MFIL-0-406SCP	. . SCREW	4
238	AN935-4	. . LOCKWASHER	4
239	AN960-4	. . WASHER, FLAT	4
		— 0 —	
240	1222650-1	. . PLATE, COVER	1
		 ATTACHING PARTS	
241	MFIL-0-604SCP	. . SCREW	3
242	AN935-6	. . LOCKWASHER	3
		— 0 —	
243	1254352-()	. . PLATE, IDENTIFICATION	1
		 ATTACHING PARTS	
244	0-330-2	. . SCREW	2
		— 0 —	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
245	1222638-1	. . STRIP, INSULATING	2
246	1222624-1	. . STRIP, TERMINAL	2
247	MFIL-0-408SCP	 ATTACHING PARTS	8
248	AN935-4	. . SCREW	8
		. . LOCKWASHER	
		— 0 —	
249	1238123-1	. . CAPACITOR	1
		 ATTACHING PARTS	
250	MFIL-0-803SCP	. . SCREW	2
251	AN935-8	. . LOCKWASHER	2
		— 0 —	
252	1247302-1	. . WASHER, RING	1
253	0-415-600	. . CONNECTOR (AN3102E-36-7P) (P2001)	1
		 ATTACHING PARTS	
254	MFIL-0-806SCP	. . SCREW	4
255	AN935-8	. . LOCKWASHER	4
		— 0 —	
256	1219270-14	. . CAP, SHIPPING	1
257	1236619-1	. . AZIMUTH DRIVE ASSEMBLY	1
OR			
257A	1236619-2	. . AZIMUTH DRIVE ASSEMBLY LESS ITEMS 274, 275, 276	1
		 ATTACHING PARTS	
258	MACH-0-1614SCP	. . SCREW	4
259	AN935-416	. . LOCKWASHER	4
260	AN960-416	. . WASHER, FLAT	4
		— 0 —	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
261	CK-2006-9-A1	. . . MOTOR ASSEMBLY, AZ DRIVE (B2001)	1
262	MFIL-0-607SCP	 ATTACHING PARTS	3
263	AN935-6	. . . SCREW	3
264	1222617-1	. . . LOCKWASHER	3
		. . . CLAMP, MOTOR	
		— 0 —	
265	1236617-1	. . . PINION, MOTOR	1
		 ATTACHING PARTS	
266	AN345-4	. . . NUT	1
267	AN935-4	. . . LOCKWASHER	1
		— 0 —	
268 OR 268A	1222607-1	. . . HOUSING ASSEMBLY, DOWELLED (Part of item 257)	1
	1222607-2	. . . HOUSING ASSEMBLY, DOWELLED (Part of item 257A) (Less items 274, 275, 276)	1
269	Part of item 268 or 268A	. . . PLATE, TOP (Part of matched set, not available separately)	1
270 OR 270A	Part of item 268	. . . HOUSING, GEAR (Part of matched set, not available separately)	1
	Part of item 268A	. . . HOUSING, GEAR (Part of matched set, not available separately)	1
271	PRSS-948-31B	. . . DOWEL PIN	2
272	MFIL-0-808SCP	. . . SCREW	6
273	AN935-8	. . . LOCKWASHER	6
274	1222615-1	. . . BOSS, THREADED (Part of item 268)	1
		 ATTACHING PARTS	
275	MFIL-0-1009SCP	. . . SCREW (Part of item 268)	2

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
276	AN935-10	. . . LOCKWASHER (Part of item 268) — 0 —	2
277	1222612-2	. . . SLEEVE	1
278	1210570-2	. . . KEY	1
279	1236618-1	. . . GEAR	1
280	718298-1	 ATTACHING PARTS	1
281	AN935-416L	. . . NUT	1
282	1222612-1	. . . LOCKWASHER — 0 —	1
283	1210570-1	. . . SLEEVE	1
284	1222601-1	. . . KEY	1
285	718298-1	. . . GEAR, PINION	1
286	AN935-416L	 ATTACHING PARTS	1
287	1222606-1	. . . NUT	1
288	1222628-1	. . . LOCKWASHER — 0 —	1
289	1222629-1	. . . GEAR AND SHAFT	1
290	T1R-62SCP	. . . GEAR ASSEMBLY	1
291	1222614-1	. . . GEAR AND SHAFT	6
292	1222616-1	. . . RING, RETAINING	3
293	708112-1	. . . SPACER	3
294	1222613-1	. . . SPACER	3
295	1213493-2	. . . WASHER, SPRING	6
		. . . BEARING, BALL	2
		. . . CLAMP, CABLE	

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
296	1213493-1	. . CLAMP, CABLE	2
297	1213493-4	. . CLAMP, CABLE	1
298	1213459-3	. . WASHER, CABLE CLAMP	5
299	Not available as an assembly	. . TORQUE TUBE AND SLIP RING DRIVE	1
300	MASH-0-1008SCP	 ATTACHING PARTS	6
301	AN935-10	. . SCREW	6
		. . LOCKWASHER	
		— 0 —	
302	1222696-1	. . . POINTER, INDEXING	1
		 ATTACHING PARTS	
303	MFIL-0-304SCP	. . . SCREW	2
304	AN935-3	. . . LOCKWASHER	2
305	AN960-3	. . . WASHER, FLAT	2
		— 0 —	
306	1222639-1	. . . FLANGE ASSEMBLY, MOUNTING	1
307	778399-8	. . . INSERT (Heli-coil)	7
		 ATTACHING PARTS	
308	MASH-0-1010SCP	. . . SCREW	5
309	AN935-10	. . . LOCKWASHER	5
		— 0 —	
310	1222656-1	. . . BEARING, BALL	1
311	1222636-1	. . . SEAT, BEARING	1
312	1222627-1	. . . RETAINER, BEARING	1
		 ATTACHING PARTS	
313	MFIL-0-606SCP	. . . SCREW	6

GROUP ASSEMBLY PARTS LIST FOR FIGURE 9-10. (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY.
314	AN935-6	. . . LOCKWASHER —— 0 ——	6
315	1222625-1	. . . RING, RETAINING	1
316	1222630-1	. . . BEARING, BALL	1
317	1248794-1	. . . SPACER	1
318	1222622-1	. . . WASHER, SPRING	1
319	1225393-1	. . . SLIP RING AND LEAD ASSEMBLY	1
320	1222626-1	. . . GEAR AND PIN ASSEMBLY	1
321	PRSS-792-24B	. . . DOWEL PIN	1
322	MFIL-0-608SCP	 ATTACHING PARTS	
323	AN935-6	. . . SCREW . . . LOCKWASHER —— 0 ——	5 5
324	1222623-1	. . . TORQUE TUBE ASSEMBLY	1
325	778399-3	. . . INSERT (Heli-coil)	5
326	FFIL-0-1025SCP	. . SCREW, ADJUSTING (Not used on current models)	1
327	N-0-10SCP	. . NUT, LOCKING (Not used on current models)	1

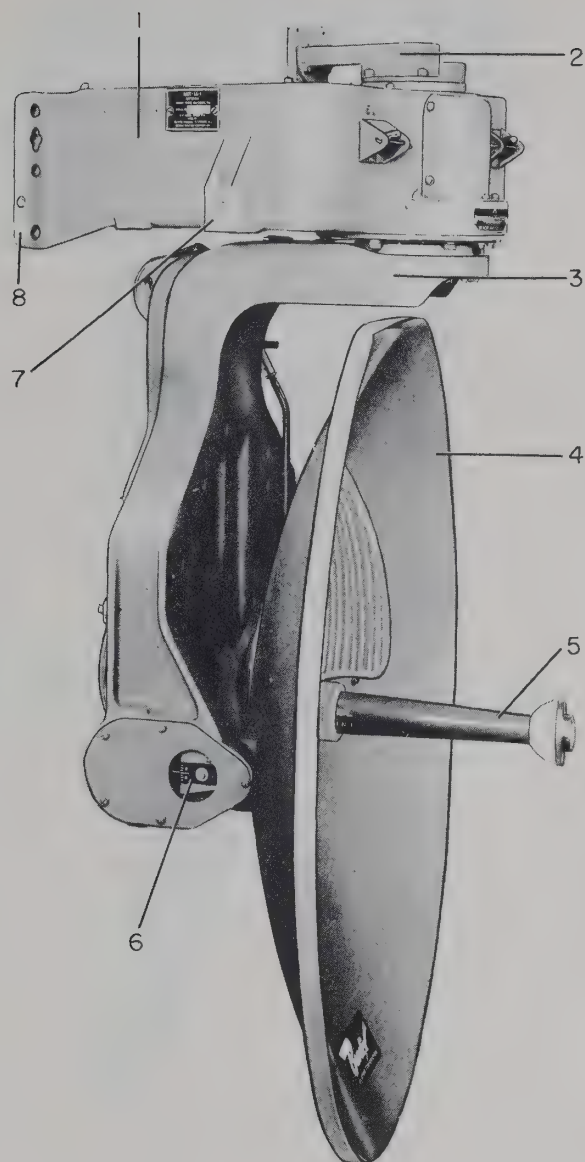
TABLE 8-1. ANT-1() ANTENNA R-F COMPONENT PART NUMBERS

COLUMN	1	2		3	4	5		
		REFLECTOR	DIAMETER (INCHES)			ASSEMBLY	WAVEGUIDE FLEXIBLE ELBOW	RIGID TWIST SECTION
X	ANT-1A	1238913-1	22	1225023-2	1256995-2	---	---	1225026-1
X	ANT-1A-1	1247255-2	22	1225023-2	1247301-2	1264153-1	1264154-1	1264155-1
X	ANT-1B	1247255-2	22	1247350-2	1247301-2	1264153-1	1264154-1	1264155-1
C	ANT-1C	1247255-1	22	1247307-1	1247313-1	1275625-1	1275624-1	1275626-1
C	ANT-1D	1247257-1	30	1247308-1	1247313-1	1275625-1	1275624-1	1275626-1
X	ANT-1E	1247257-1	30	1255789-2	1247301-2	1264153-1	1264154-1	1264155-1

SECTION IX

ILLUSTRATIONS

Figure 9-7 is a schematic diagram of the ANT-1() Antenna. An additional reproducible copy of the schematic diagram is included at the end of this section.



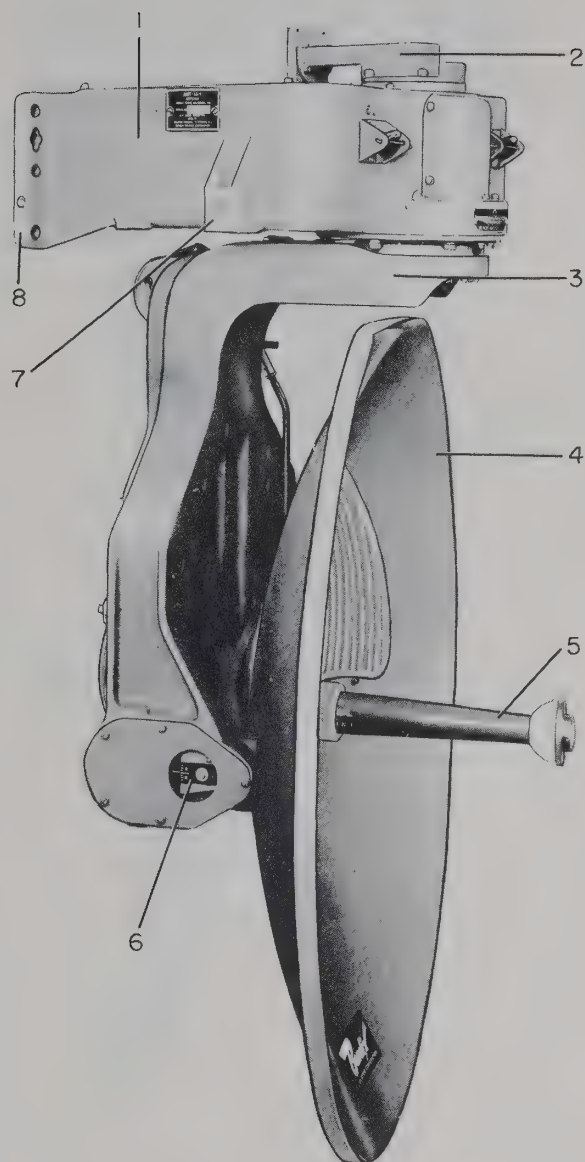
- | | | | |
|---|--------------------------------------|---|---------------------------------------|
| 1 | Antenna base | 5 | Feed section, circular wave-
guide |
| 2 | R-f input section of rotary
joint | 6 | Degree of tilt index marks |
| 3 | Antenna frame | 7 | Mounting boss |
| 4 | Parabolic reflector, trun-
cated | 8 | Mounting flange |

Figure 9-1. ANT-1B() Antenna, Part of RDR-1 (X-band) Airborne Radar System, Left Side View

SECTION IX

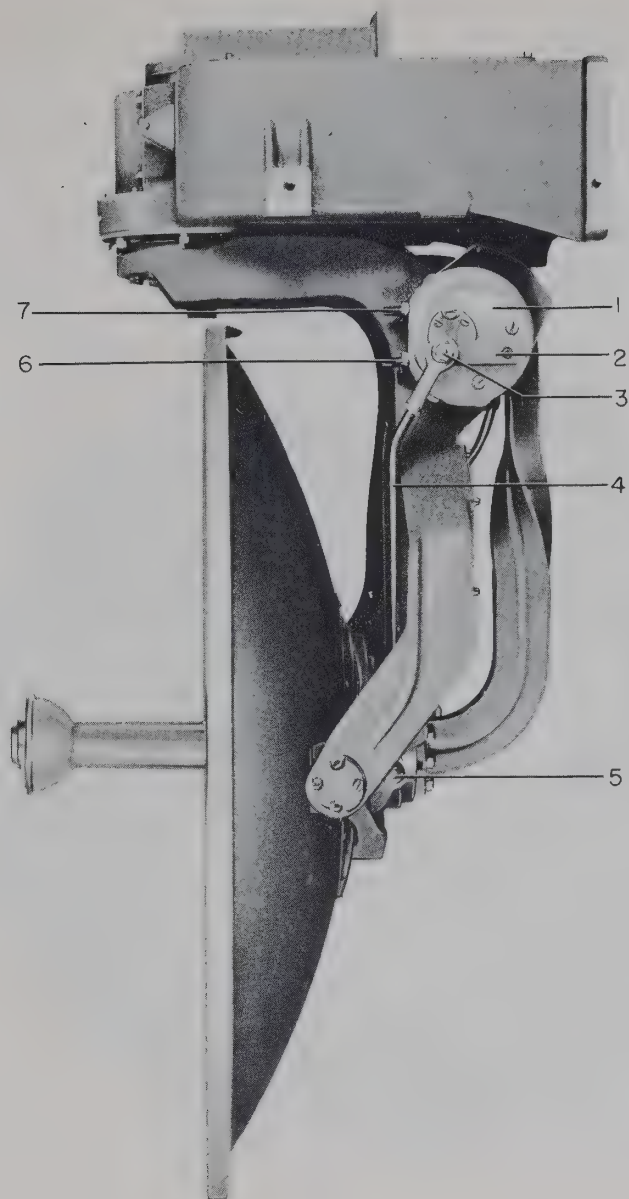
ILLUSTRATIONS

Figure 9-7 is a schematic diagram of the ANT-1() Antenna. An additional reproducible copy of the schematic diagram is included at the end of this section.



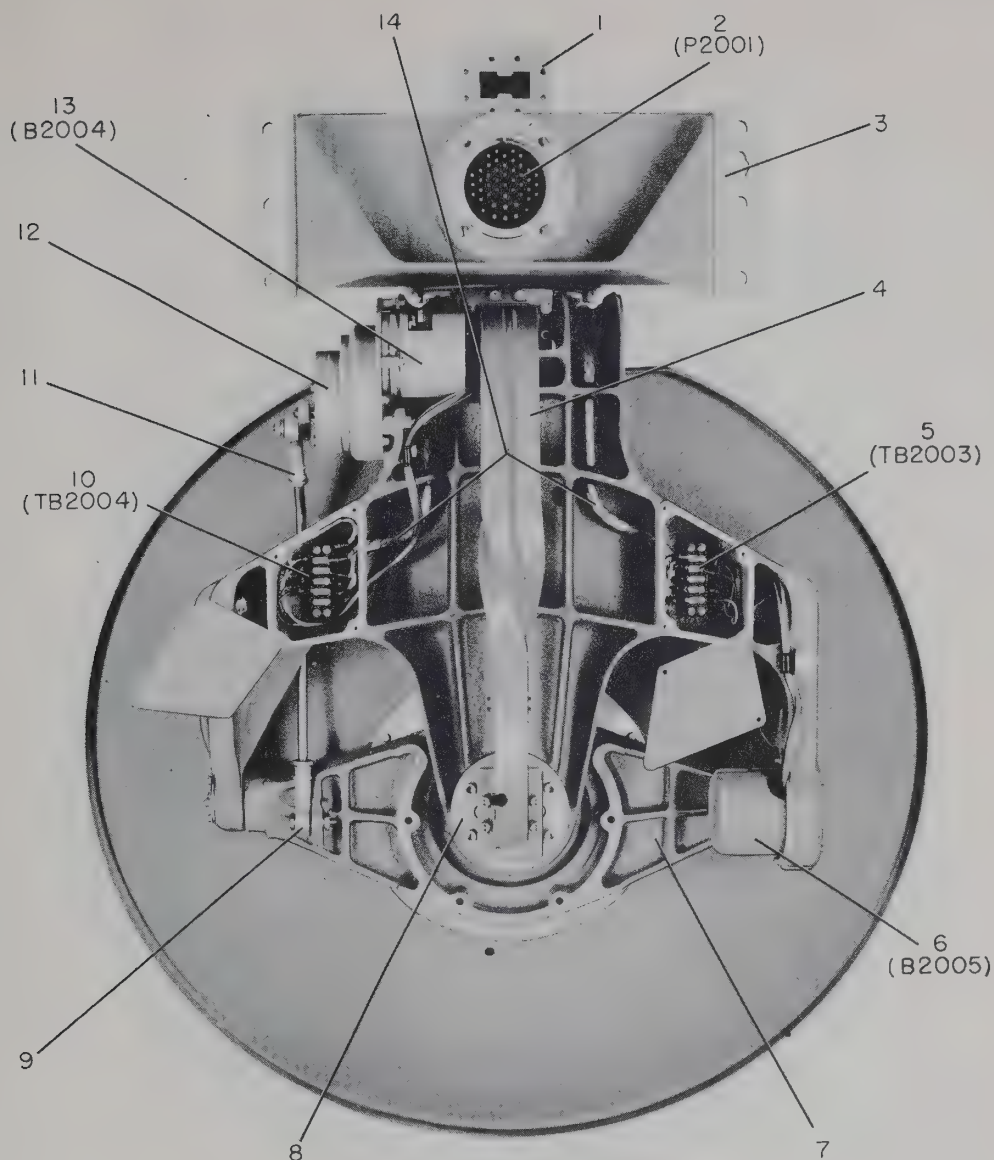
- | | | | |
|---|-----------------------------------|---|----------------------------------|
| 1 | Antenna base | 5 | Feed section, circular waveguide |
| 2 | R-f input section of rotary joint | 6 | Degree of tilt index marks |
| 3 | Antenna frame | 7 | Mounting boss |
| 4 | Parabolic reflector, truncated | 8 | Mounting flange |

Figure 9-1. ANT-1B() Antenna, Part of RDR-1 (X-band) Airborne Radar System, Left Side View



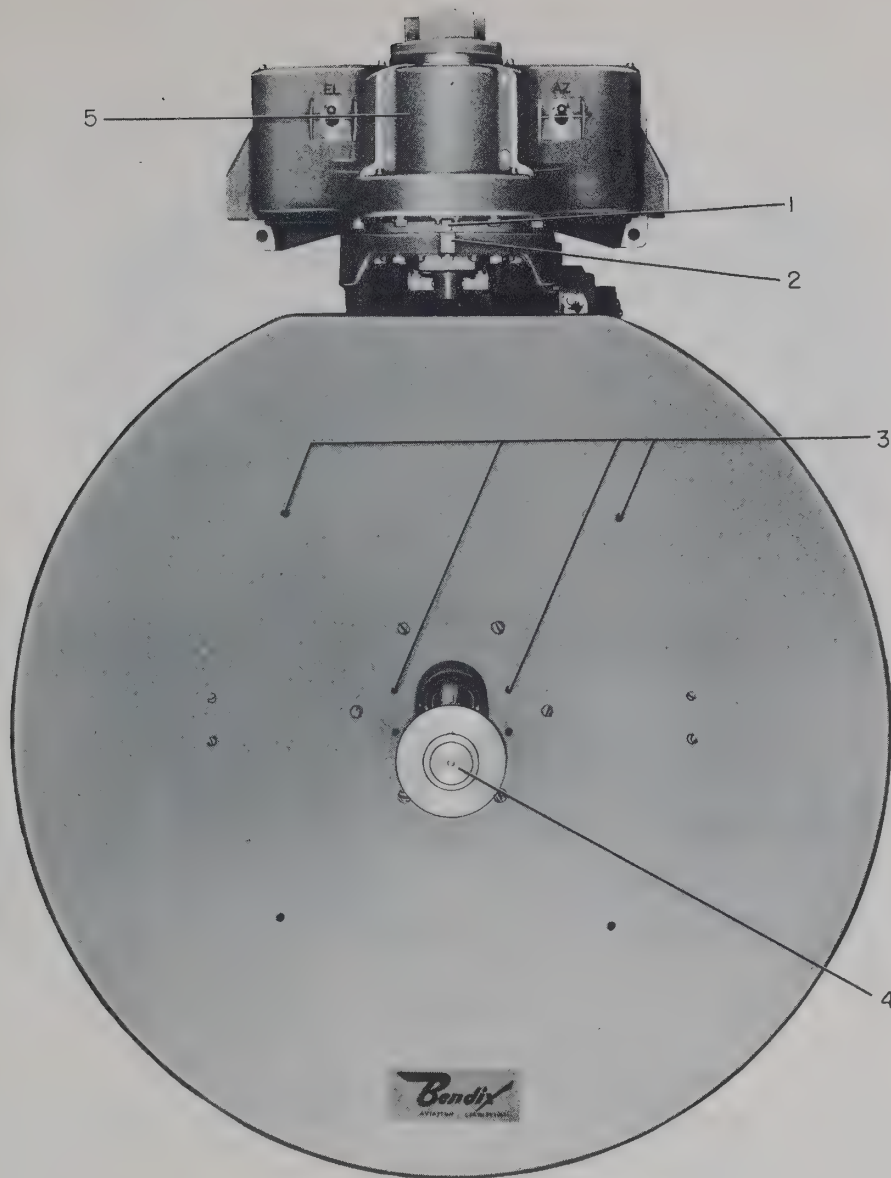
- | | |
|------------------------------------|----------------------------------|
| 1 Azimuth drive gear assembly | 4 Connecting rod |
| 2 Tilt lever arm | 5 Connecting rod lower bearing |
| 3 Connecting rod upper bearing | 6 Spring loaded (up-tilt) buffer |
| 7 Spring loaded (down tilt) buffer | |

Figure 9-2. ANT-1C() Antenna, Part of RDR-1 (C-band) Airborne Radar System, Right Side View



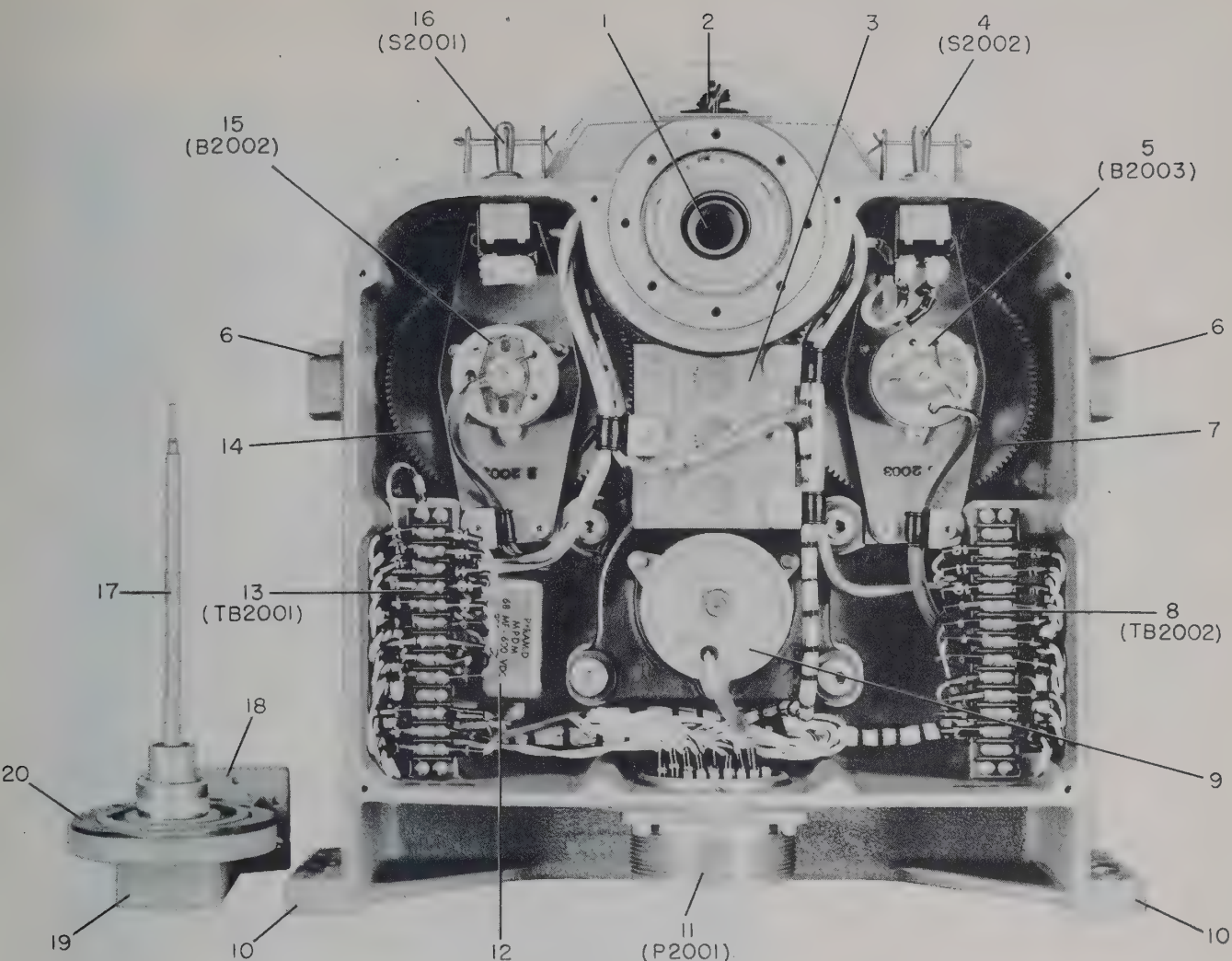
- | | |
|---|--------------------------------------|
| 1 R-f input flange | 8 Feed section mounting flange |
| 2 Electrical connector (P2001) | 9 Connecting rod lower bearing |
| 3 Mounting flange | 10 Terminal board (TB2004) |
| 4 Waveguide, connecting section | 11 Connecting rod upper bearing |
| 5 Terminal board (TB2003) | 12 Tilt drive gear assembly |
| 6 Tilt control transmitter (B2005),
(cover in place) | 13 Tilt drive motor (B2004) |
| 7 Reflector support | 14 Cables from slip ring
assembly |

Figure 9-3. ANT-1C() Antenna, Part of RDR-1 (C-band) Airborne Radar System, Rear View



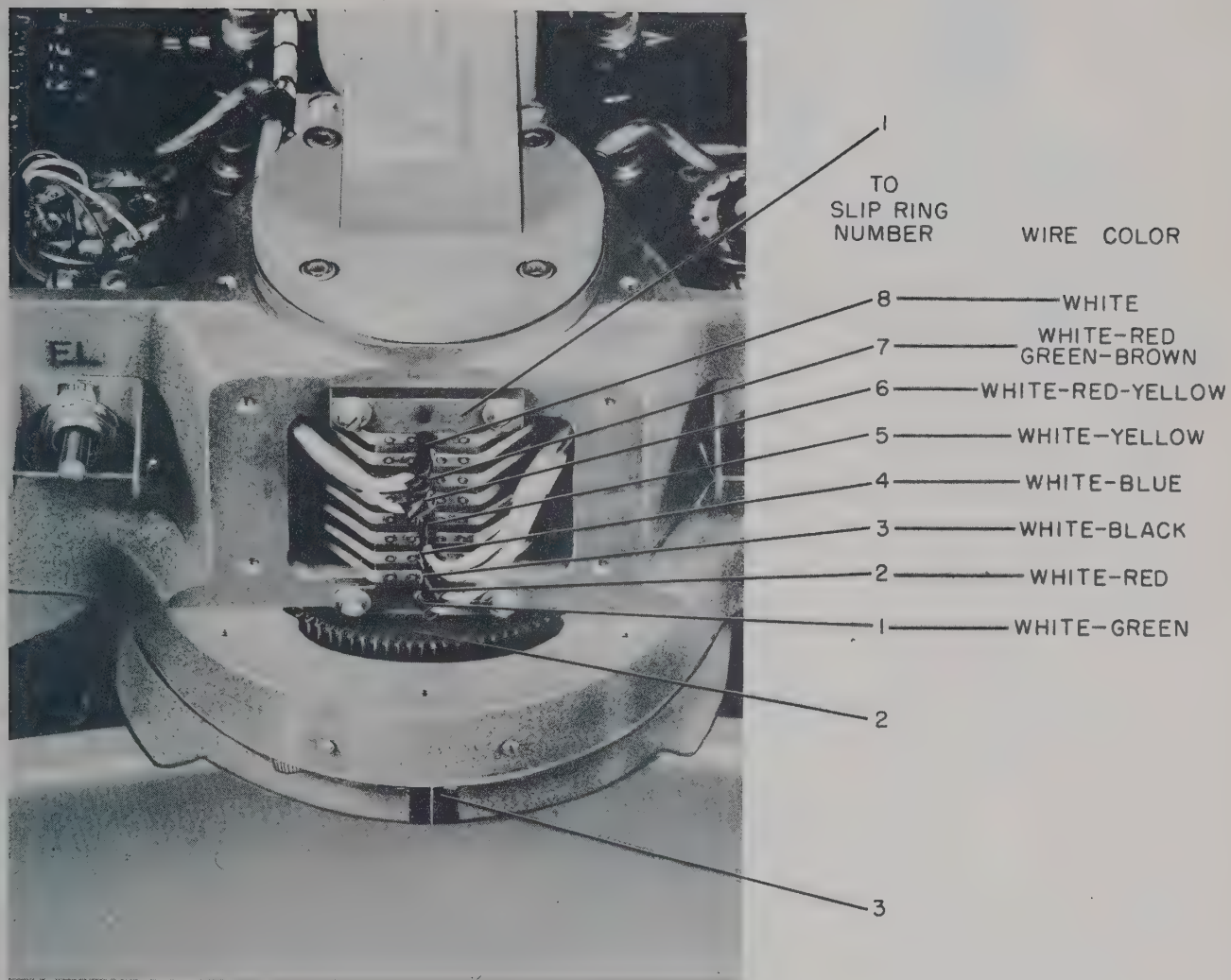
- 1 Azimuth zero degree index mark (reference)
- 2 Azimuth zero degree index mark (rotates with frame)
- 3 Grid mounting holes
- 4 Circular ring feed
- 5 Brush assembly cover

Figure 9-4. ANT-1C() Antenna, Part of RDR-1 (C-band) Airborne Radar System, Front View



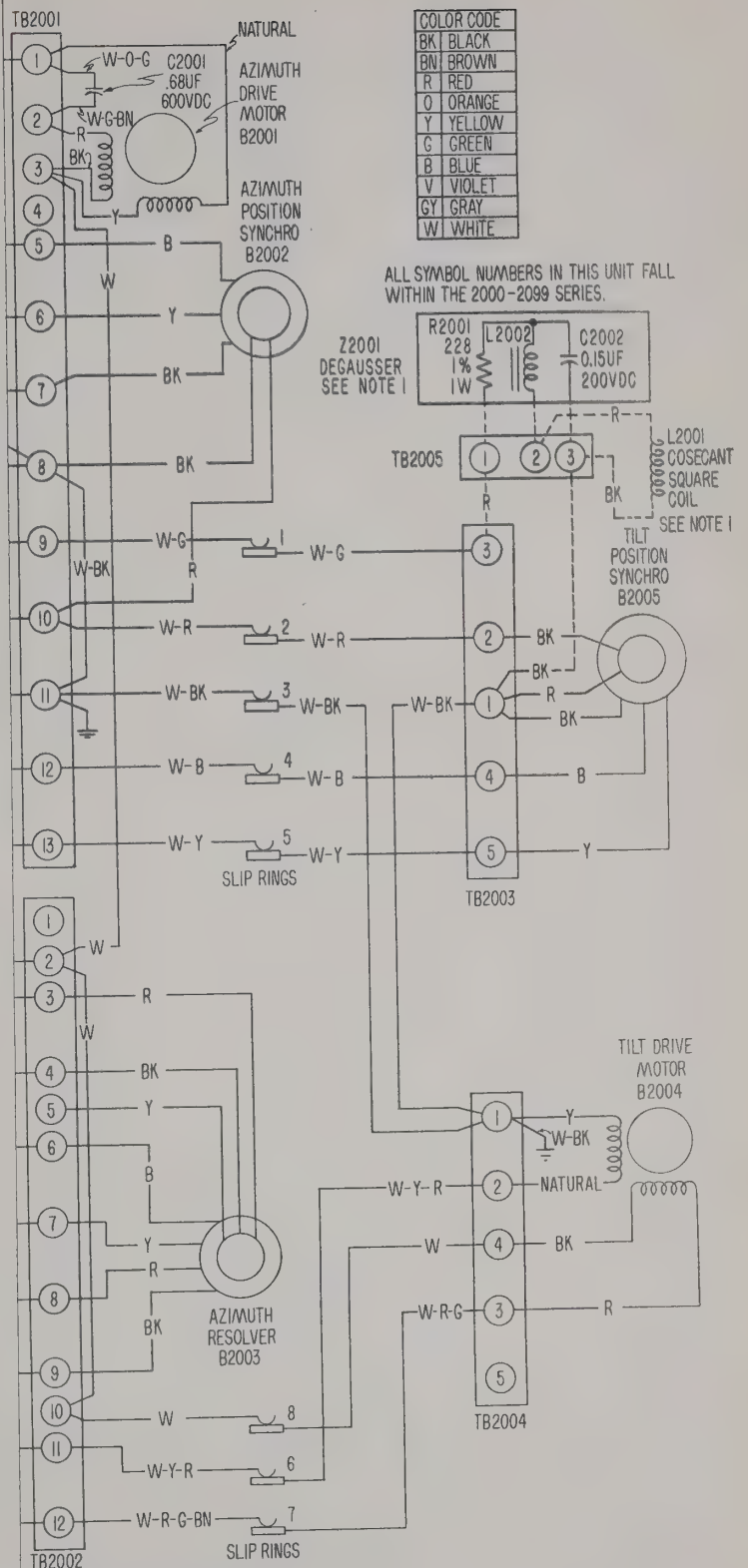
- | | | | |
|----|--|----|---|
| 1 | Outer conductor (rotating section) of rotary joint | 11 | Electrical connector (P2001) |
| 2 | Brush assembly | 12 | Phasing capacitor for azimuth drive motor B2001 (C2001) |
| 3 | Azimuth drive gear assembly | 13 | Terminal board (TB2001) |
| 4 | Tilt drive motor switch (S2002) | 14 | Split gear assembly |
| 5 | Azimuth resolver (B2003) | 15 | Azimuth synchro generator (B2002) |
| 6 | Mounting boss | 16 | Azimuth drive motor switch (S2001) |
| 7 | Split gear assembly | 17 | Center conductor of rotary joint |
| 8 | Terminal board (TB2002) | 18 | R-f input flange |
| 9 | Azimuth drive motor (B2001) | 19 | Rotary joint transition |
| 10 | Antenna mounting bracket | 20 | Spacing shims |

Figure 9-5. ANT-1() Antenna Base Assembly, Cover and Upper Section of Rotary Joint Removed



- 1 Brush assembly
- 2 Azimuth drive gear
- 3 Azimuth zero degree index mark

Figure 9-6. ANT-1() Antenna, Section Showing Covers Removed From Brush Assembly and Azimuth Drive Gear



() Antenna, Schematic Diagram

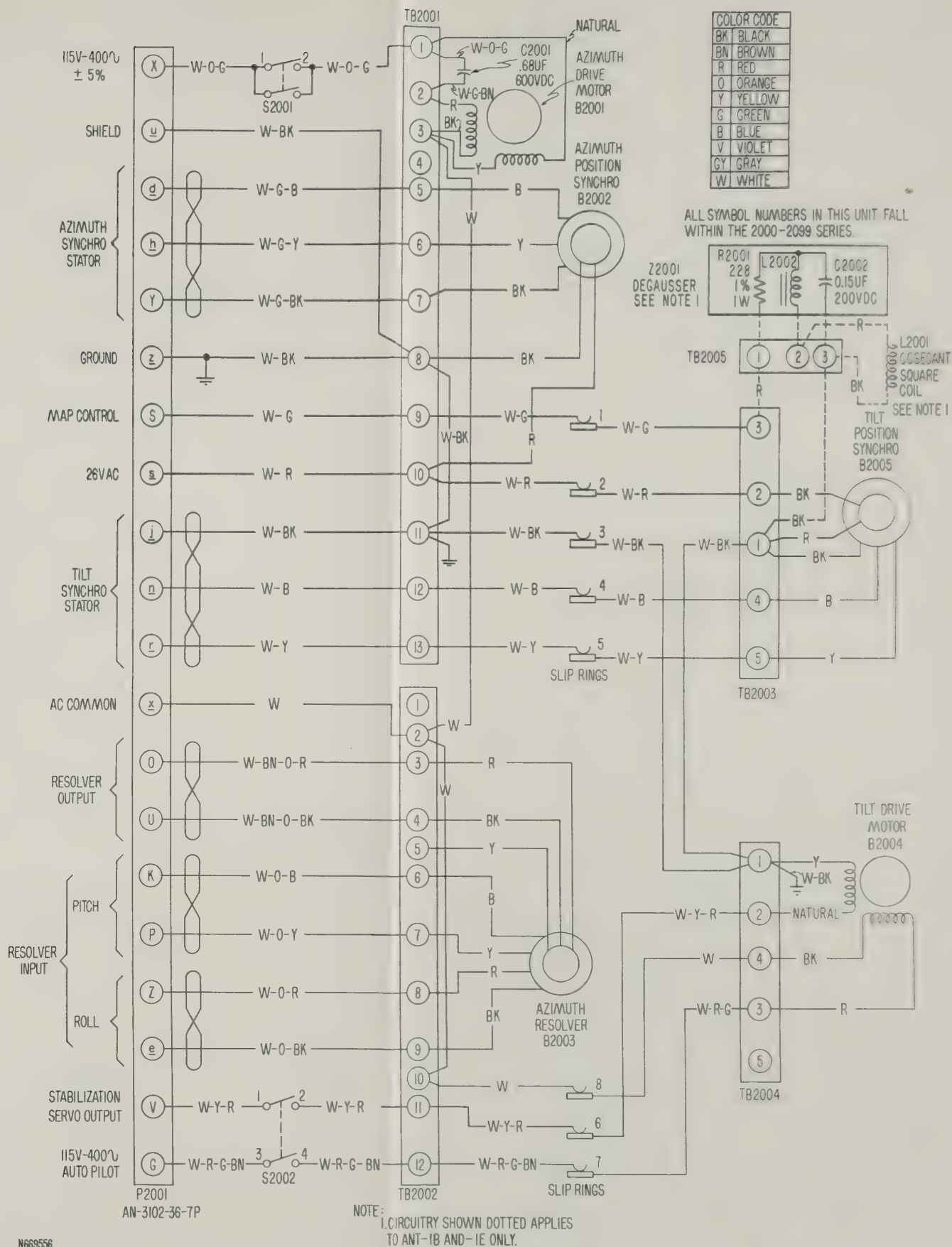


Figure 9-7. ANT-1() Antenna, Schematic Diagram

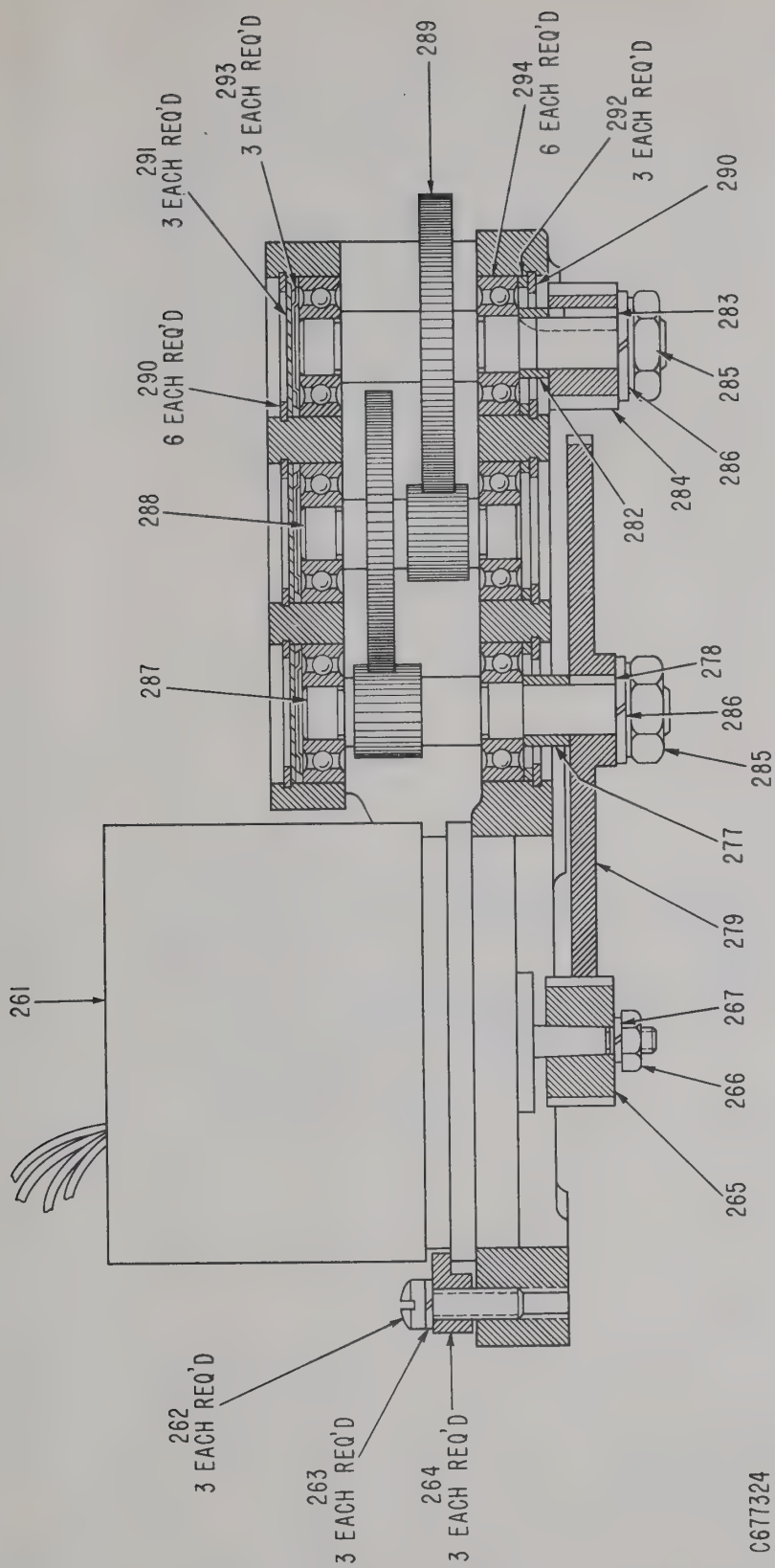
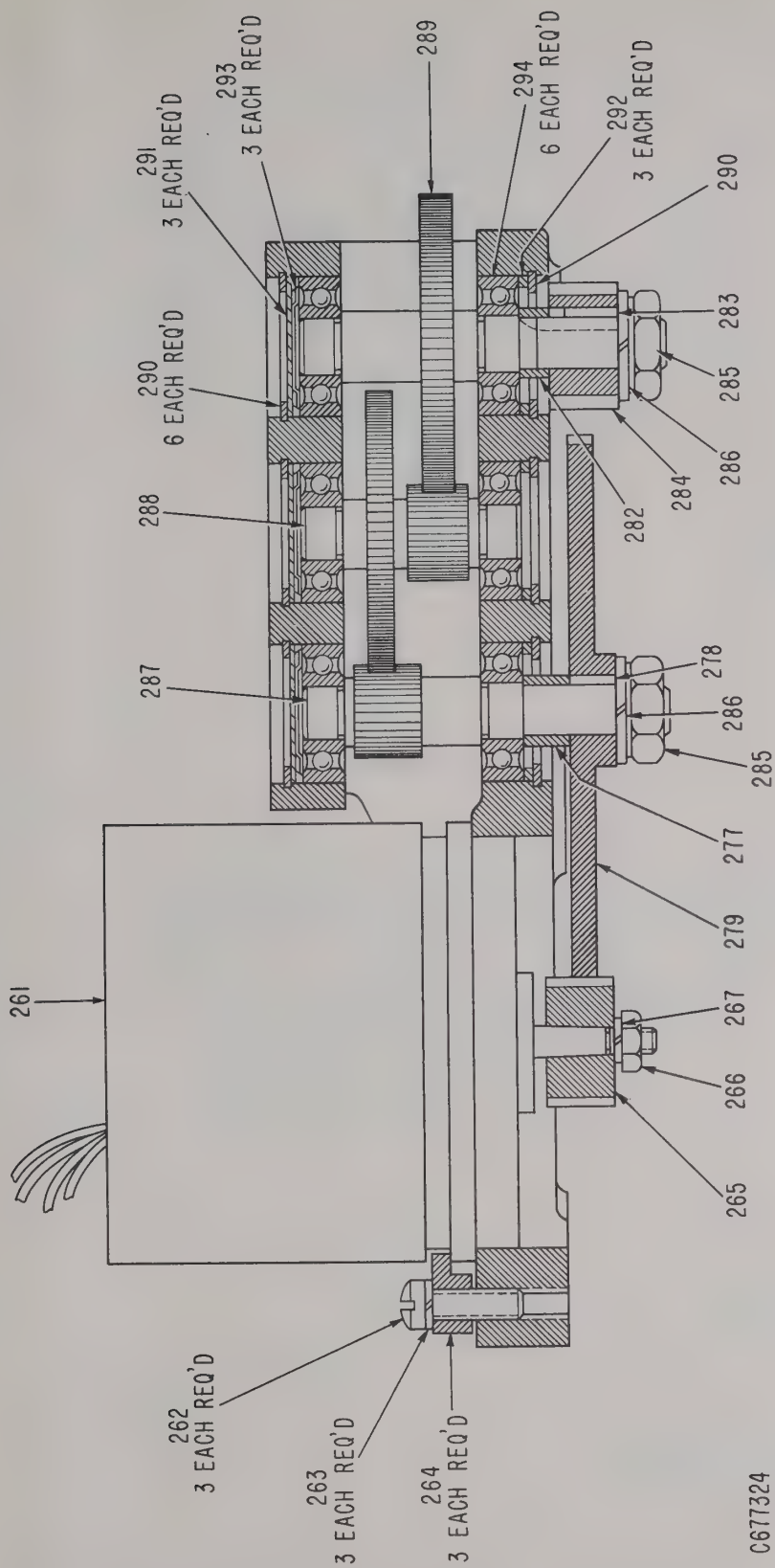


Figure 9-8. Azimuth Drive Assembly, Part of ANT-1(), Sectional View



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Figure 9-8. Azimuth Drive Assembly, Part of ANT-1(), Sectional View

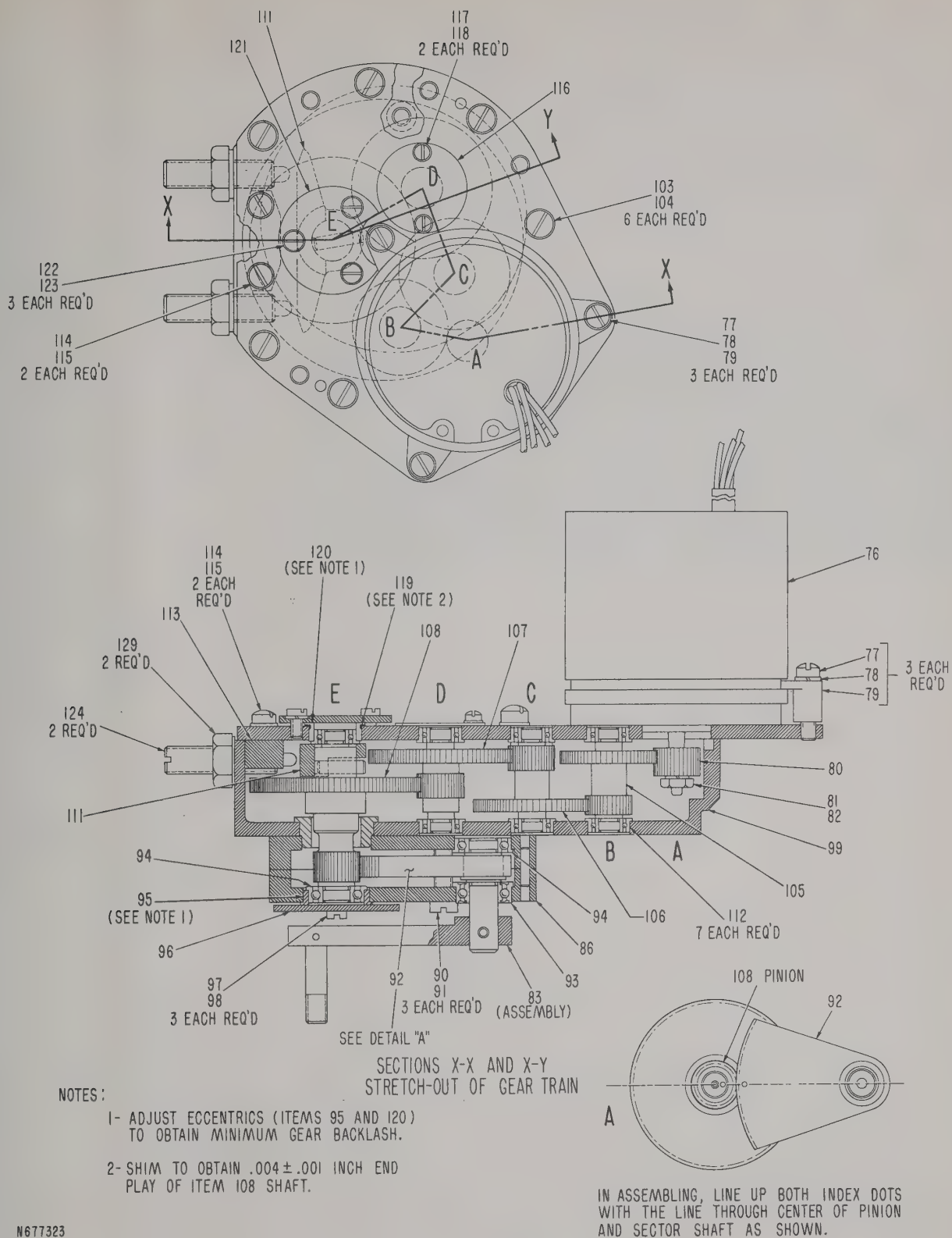


Figure 9-9. Tilt Drive Assembly, Part of ANT-1() Antenna, Plan View and Stretch-Out of Gear Train

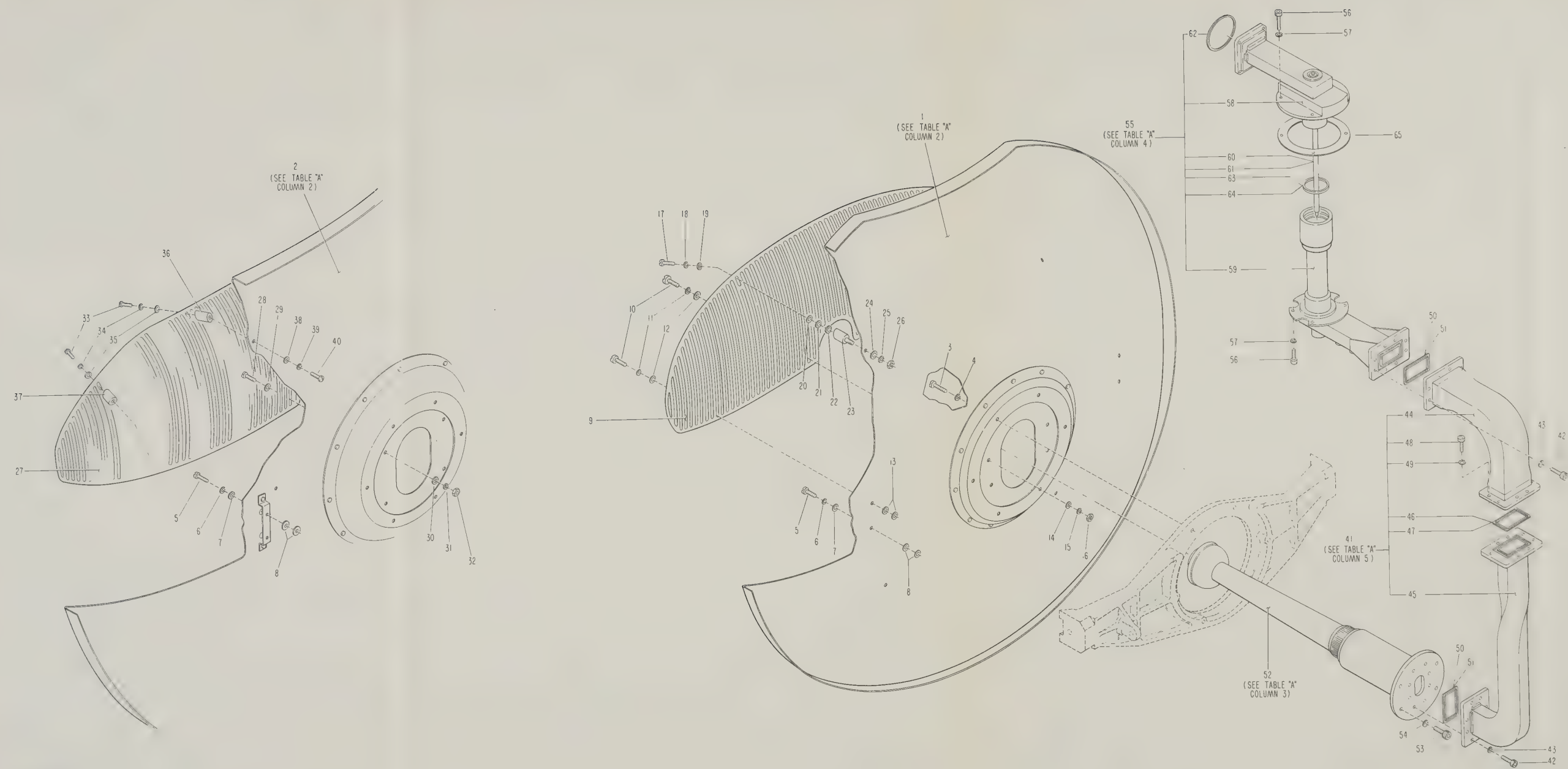
TABLE A. R-F COMPONENT PART NUMBERS

COLUMN	1	2	3	4	5			
OPERATING BAND	TYPE	REFLECTOR	DIAMETER (INCHES)	FEED SECTION	ROTARY JOINT	WAVEGUIDE		
						ASSEMBLY	FLEXIBLE ELBOW	RIGID TWIST SECTION
X	ANT-1A	1238913-1	22	1225023-2	1256995-1	—	—	1225026-1
X	ANT-1A-1	1247255-2	22	1225023-2	1247301-2	1264153-1	1264154-1	1264155-1
X	ANT-1B	1247255-2	22	1247350-2	1247301-2	1264153-1	1264154-1	1264155-1
C	ANT-1C	1247255-1	22	1247307-1	1247313-1	1275625-1	1275624-1	1275626-1
C	ANT-1D	1247257-1	30	1247308-1	1247313-1	1275625-1	1275624-1	1275626-1
X	ANT-1E	1247257-1	30	1255789-2	1247301-2	1264153-1	1264154-1	1264155-1



— 43
— 42

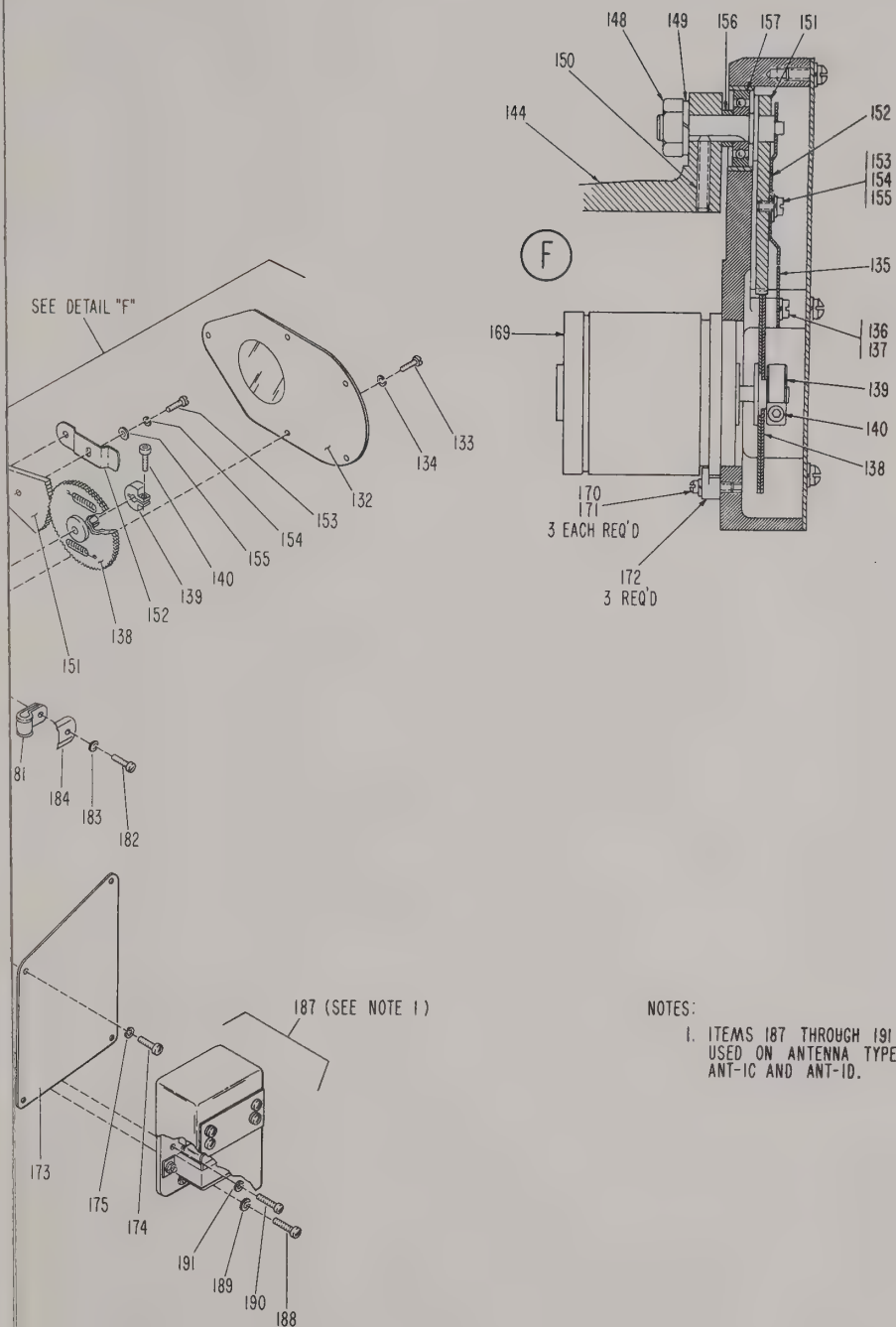
9-10. ANT-1() Antenna, Exploded View Drawing, Sheet 1 of 3



COLUMN	1	2	3	4	5			
OPERATING BAND	TYPE	REFLECTOR	DIAMETER (INCHES)	FEED SECTION	ROTARY JOINT	WAVEGUIDE		
						ASSEMBLY	FLEXIBLE ELBOW	RIGID TWIST SECTION
X	ANT-1A	123893-1	22	1225023-2	1256995-1	—	—	1225026-1
X	ANT-1A-1	1247255-2	22	1225023-2	1247301-2	1264153-1	1264154-1	1264155-1
X	ANT-1B	1247255-2	22	1247350-2	1247301-2	1264153-1	1264154-1	1264155-1
C	ANT-1C	1247255-1	22	1247307-1	1247313-1	1275625-1	1275624-1	1275626-1
C	ANT-1D	1247257-1	30	1247308-1	1247313-1	1275625-1	1275624-1	1275626-1
X	ANT-1E	1247257-1	30	1255789-2	1247301-2	1264153-1	1264154-1	1264155-1

R675545
SHEET 1 OF 3

Figure 9-10. ANT-1() Antenna, Exploded View Drawing, Sheet 1 of 3



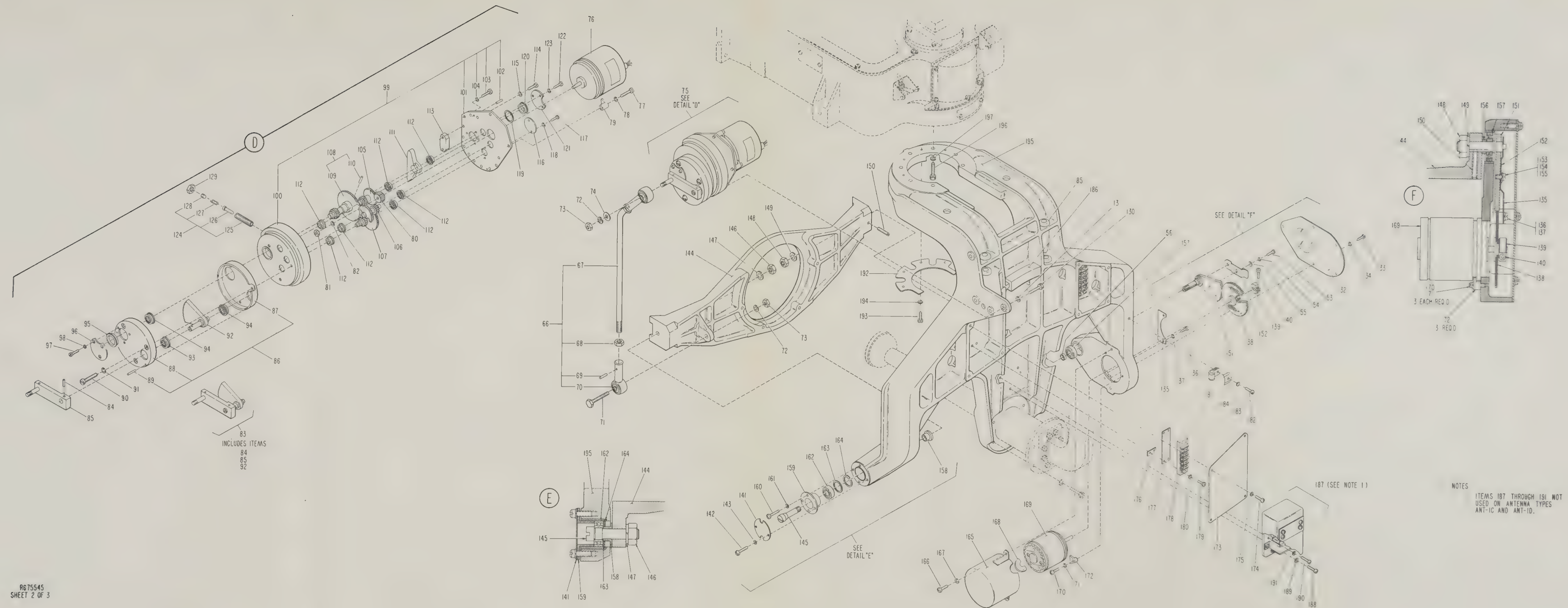
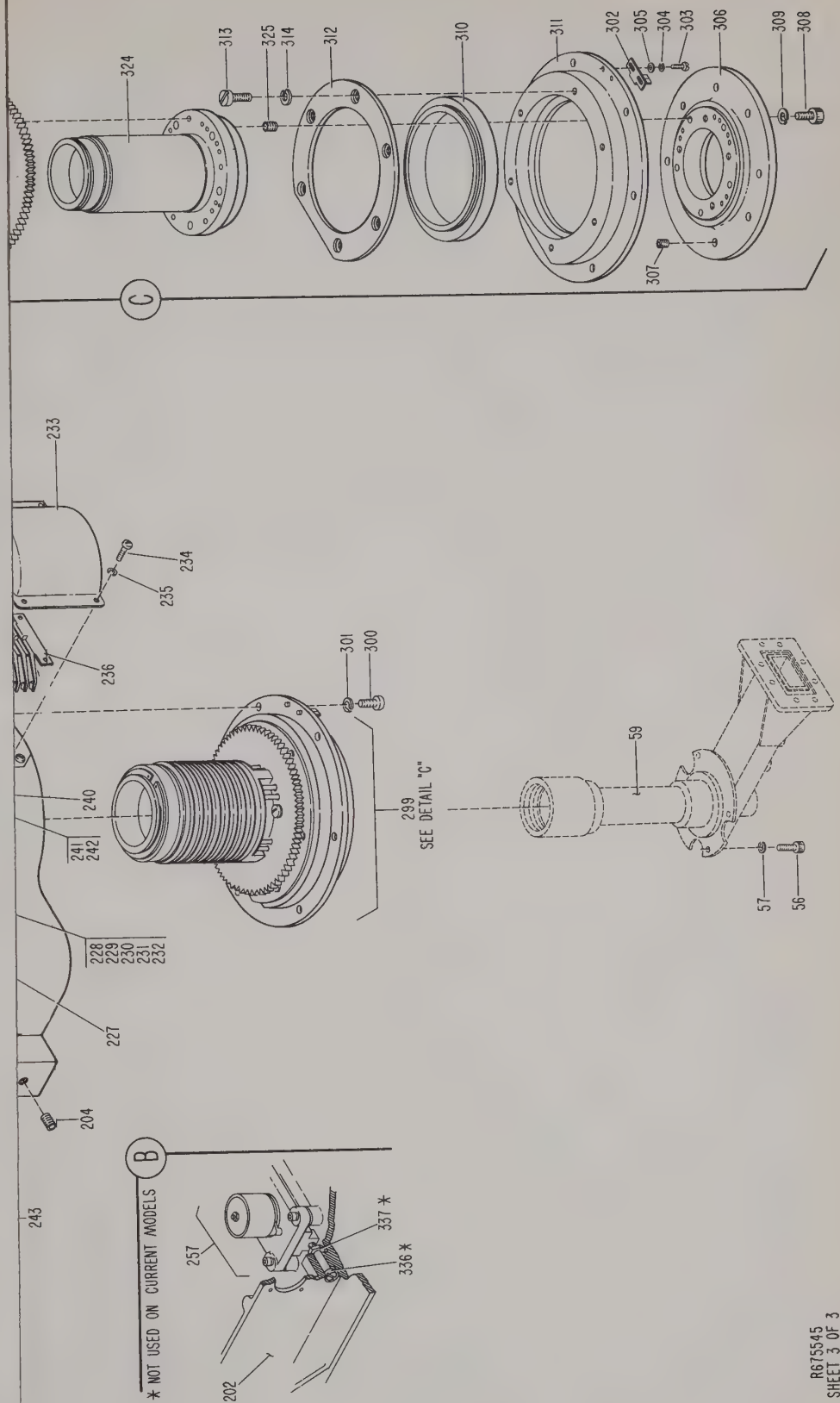


Figure 9-10. ANT-1() Antenna, Exploded View Drawing, Sheet 2 of 3



T-1() Antenna, Exploded View Drawing, Sheet 3 of 3

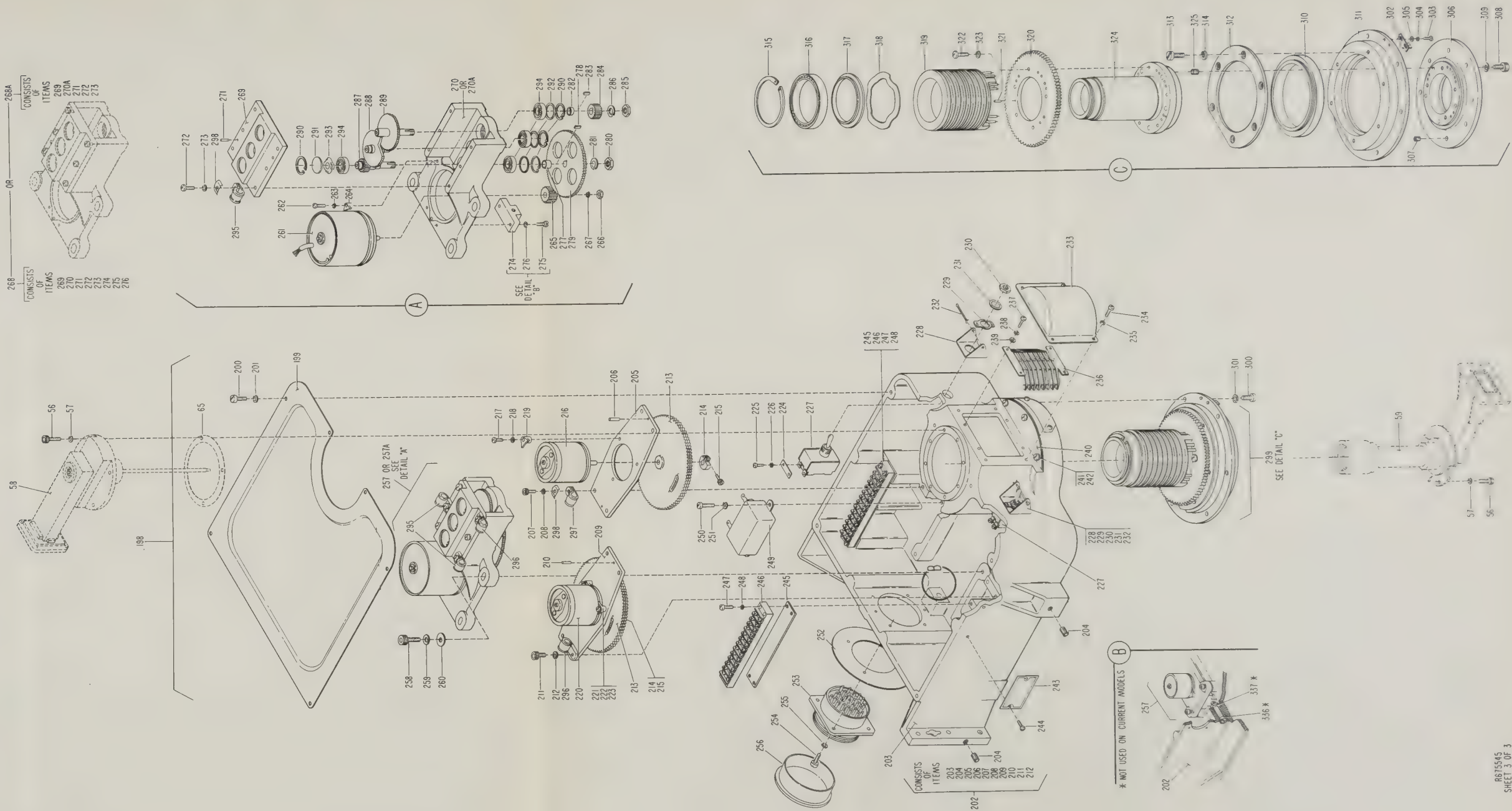


Figure 9-10. ANT-1() Antenna, Exploded View Drawing, Sheet 3 of 3

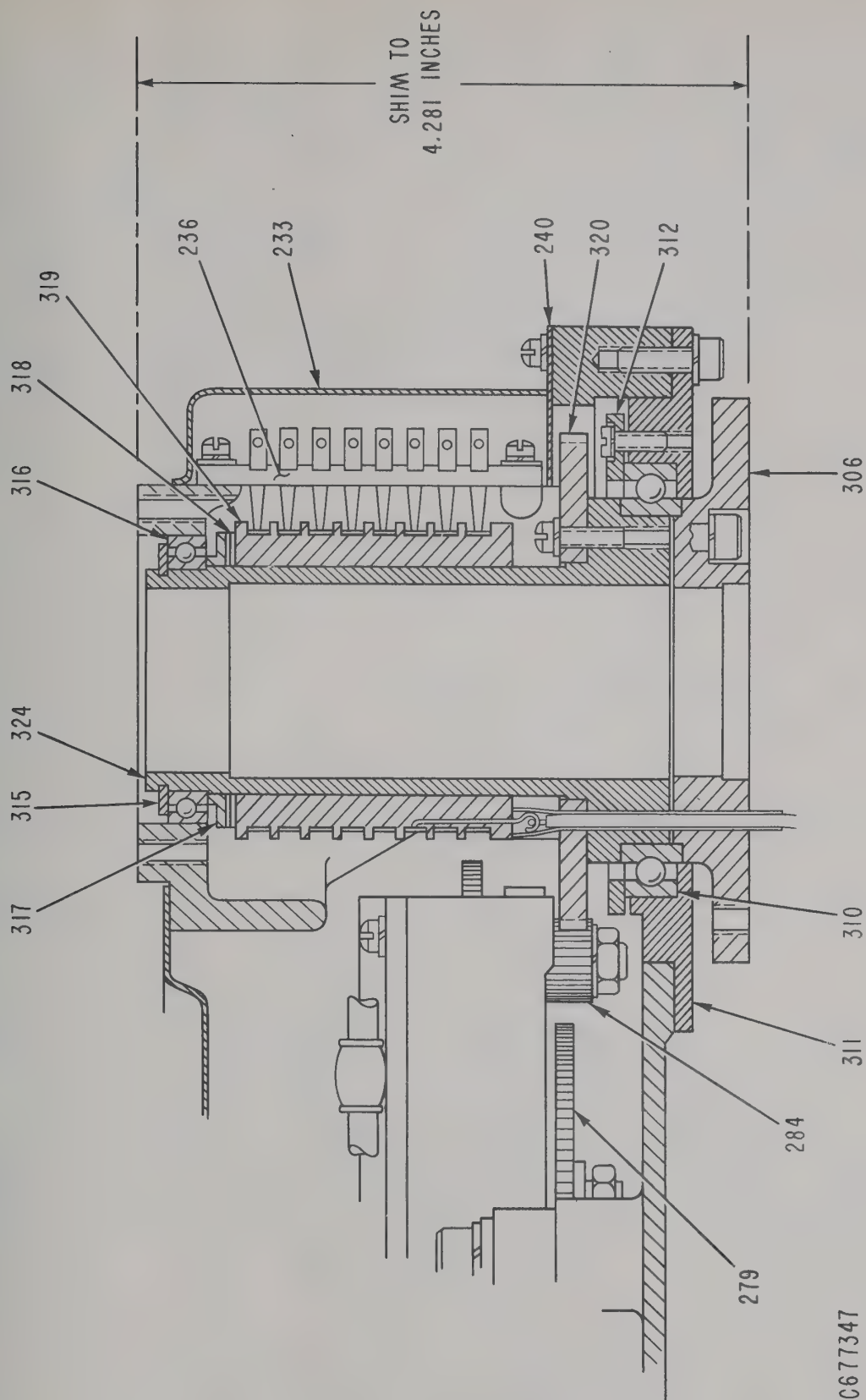


Figure 9-11. Torque Tube and Slip Ring Assembly Mounting in ANT-1()
Antenna Base, Sectional View

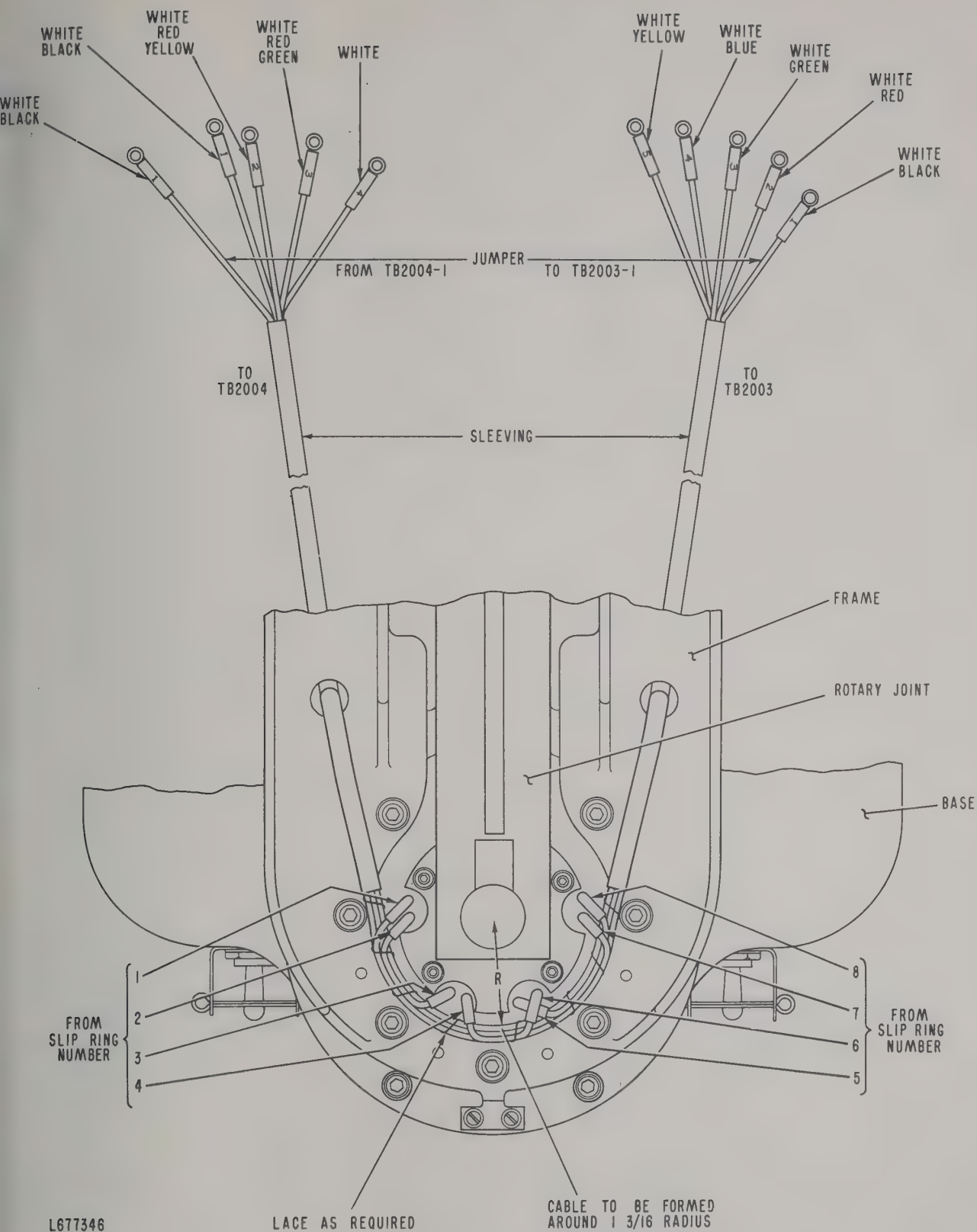


Figure 9-12. Dressing of Slip Ring Leads Below Antenna Base

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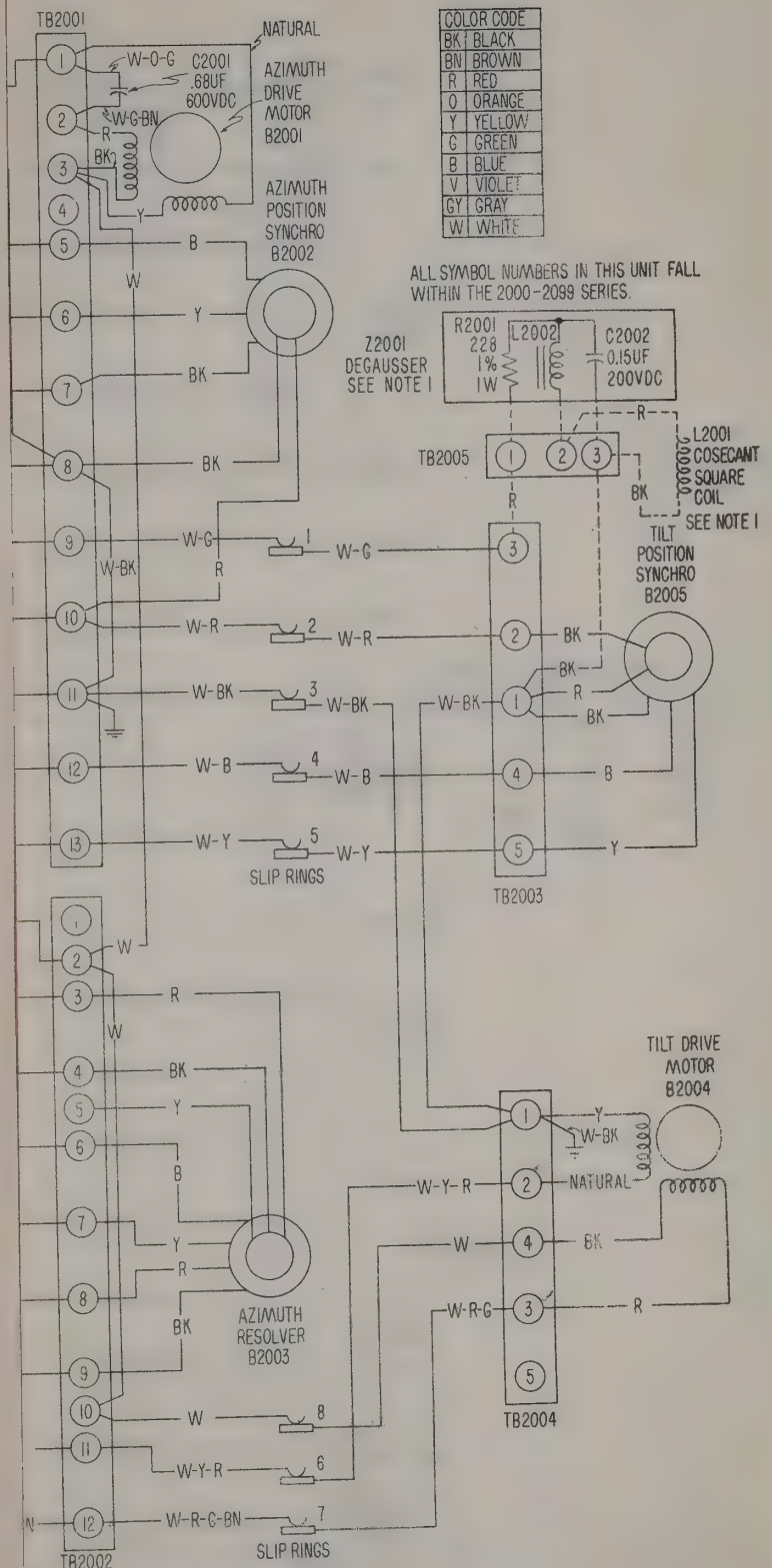
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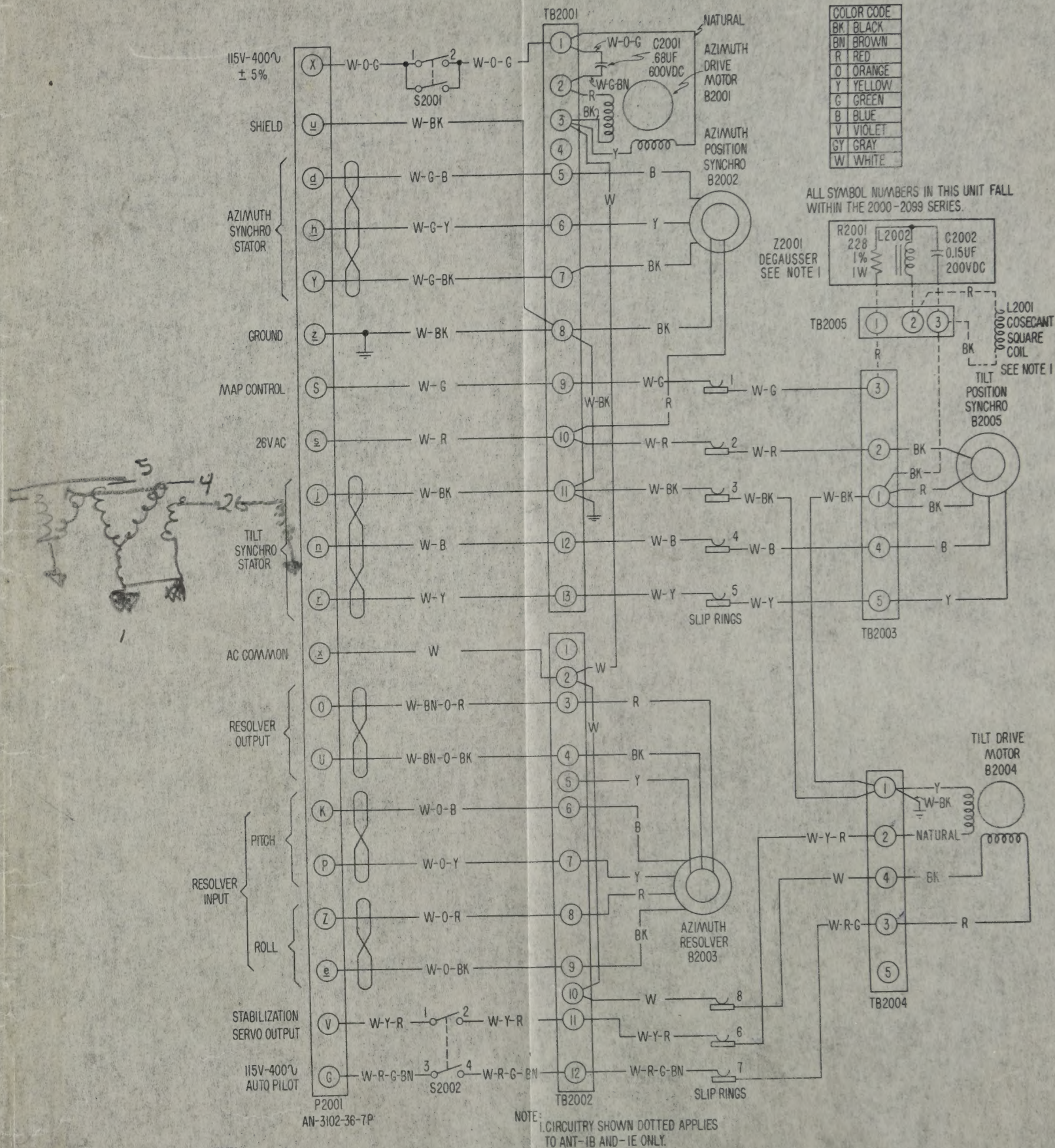
REPRODUCIBLE COPY

The following reproducible schematic diagram is printed on vellum and is perforated along its binding edge for easy removal.



NOTE: 1. CIRCUITRY SHOWN DOTTED APPLIES TO ANT-1B AND -1E ONLY.

1() Antenna, Schematic Diagram





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